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ANNALS
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Volume XLI MARCH, 1948 No. 1

CULEX (MELANOCONION) MULRENNANI, A NEW SPECIES FROM FLORIDA[1]

(Diptera: Culicidae)

ERNESTINE H. BASHAM,[2]
Florida State Board of Health

Eight species of *Culex*, subgenus *Melanoconion* are listed by Wirth (1945) as occurring in the United States, of which six have been recorded from Florida: *Culex pilosus* (D. &K.), *C. erraticus* (D. & K.), *C. peccator* D. & K., *C. atratus* Theob., *C. opisthopus* Komp, and *C. elevator* D. & K. *C. abominator* D. & K. has been recorded from Texas by King and Bradley (1937) with a later description of the larva by Eads (1943) and *C. anips* Dyar has been reported as collected in 1916 at San Diego, California by Dyar. Pritchard, et al. (1947) record four of the Florida species as occurring on the Florida Keys: *Culex atratus* Theob., *C. pilosus* (D. & K.), *C. elevator* D. & K., and *C. erraticus* (D. & K.), of which *C. atratus* Theob. is the most common species.

The present paper describes a new species of *Culex*, subgenus *Melanoconion* which was found breeding in the Florida Keys and presents brief notes on its biology and breeding habits. The species has been named *mulrennani*, in honor of Mr. John A. Mulrennan, Director, Division of Entomology, Florida State Board of Health.

BIOLOGY

On October 13, 1945, E. L. Seabrook and A. E. Pritchard collected seven male specimens of *Culex*, subgenus *Melanoconion* sp. at Big Pine Key, Monroe County, Florida, from limestone solution holes. On examination of the terminalia of the species, Dr. Alan Stone and Col. W. H. W. Komp determined it as undescribed. The occurrence of this species was noted by Pritchard, et al. (1947).

Surveys of the distribution and density of the mosquitoes of the Upper and Lower Florida Keys were made at intervals from October, 1945, through July, 1947; however, it was not until April 16, 1947, that additional specimens of this new mosquito were found, when Fred

[1]From the CDC Activities, U. S. Public Health Service, Division of Entomology, Florida State Board of Health.

[2]Entomologist, U. S. Public Health Service.

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Miller collected four pupae and reared one male from a collection made on Ramrod Key, Monroe County, Florida, from a man-made well. The well, constructed in Miami oölitic limestone, measured three feet square by three feet deep, was located in direct sunlight fifteen feet from an abandoned chicken house, absolutely devoid of all vegetation, with a water depth of approximately seven inches. Associated reared specimens were two males *C. atratus* Theob. and one female *C.* (*Melanoconion*) sp.

From the same station on April 19, 1947, Fred Miller collected two pupae and the author reared one male *C. mulrennani*; the second pupae failed to emerge.

On July 24–30, 1947, a survey was made by D. C. Thurman, Jr. and the author during which time the Ramrod Key well failed to show evidence of any mosquito breeding.

On Big Pine Key, during this same survey, larvae of *C. mulrennani* were found to be breeding in three rock holes. One, a small rectangular, shallow, water-filled depression in a limestone stratum, measured 12 by 18 inches with an average depth of 12 inches. The water contained filamentous algae and several clumps of grass. For approximately four hours a day the pool was shaded by a young slash pine (*Pinus caribaea* Morlet). The water had a pH reading of 8.1. From this pool 116 larvae and 7 pupae were collected and one male and three females were taken resting on the sides of the depression.

Contrasted to the previously described breeding habitats were two oölitic limestone solution holes eight feet deep, that measured respectively 6 and 8 inches in diameter at the top. The water level was normally about 6 feet below the soil surface. Both were free of algae and other vegetation and were formed in such a way that the water surface was completely shaded. A total of 307 larvae were collected.

Rearing the larvae under laboratory conditions proved difficult making it necessary that the rearing be accomplished in the field. Containers were placed in breeding holes where individual specimens of larvae were isolated and allowed to pupate and the adults to emerge under natural conditions. Under these conditions it was found the duration of the fourth larval stage to be from 1 to 2 days and the usual duration of the pupal stage to be from 14 to 18 hours. Four males and four females *C. mulrennani* were successfully reared. While many larvae of this species have been collected from their specialized breeding places, adults have rarely been taken except by rearing.

DESCRIPTION OF ADULT

FEMALE: Very small, all-dark species.

Proboscis.—Long, dark scaled with bronze reflections, tip slightly swollen.

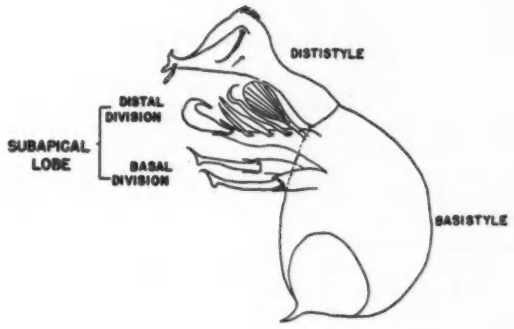
Palpi.—Dark scaled.

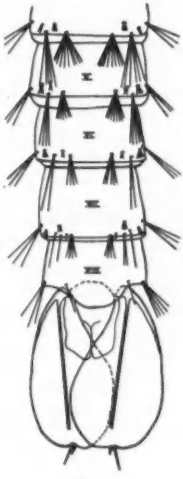
Occiput.—Clothed laterally with numerous broad, appressed silvery-gray scales and antero-dorsally with opalescent scales, with a few dark setae anteriorly directed and postero-dorsally with scattered copper to dark brown erect forked scales.

Thorax.—Integument brown, clothed with fine, lanceolate bronze scales.

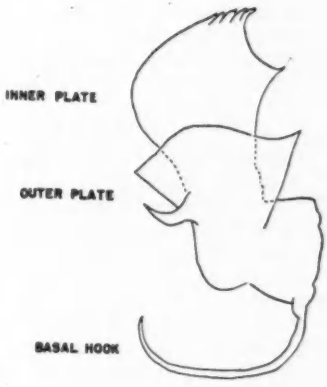
TRUMPET of PUPA

NINTH TERGITE





PUPA



PHALLOSOME
(LATERAL VIEW)

Culex (*Melanoconion*) *mulrennani* Basham. Structures of pupa and adult.

Halteres.—Integument of scabellum and mid-halter light, capitellum with dark bronze scales.

Wings.—All dark scaled, plume scales narrow, squame scales broad.

Abdomen.—Clothed dorsally with bronze to dark copper scales, laterally with all dark scales or with minute triangular light spots at the base of posterior segments, ventrally with few basal light scales.

Tarsi.—Dark scaled with apparent bronze reflections.

MALE: Coloration similar to that of the female with the exception of abdominal white scaling being more prominent.

Terminalia (Plate I)[3]: *Lobes of ninth tergite.*—Large, ovate, approximate at bases, apical projection extended laterally, widely separated, clothed with numerous, long smooth setae arising from distinct tubercules on basal and apical portions. (12–16 setae on base and 8–12 on apex.)

Tenth sternite.—Crowned with comb-like row of 9–12 blunt spines.

Phallosome.—Inner plate broad, rounded with 4 or 5 blunt points at the dorsal angle, concave laterally; outer plate with lateral tooth; basal hook long and narrow.

Basistyle.—Large, bulbous, clothed with long, smooth setae on apical half, broad scales on basal half and numerous fine hair-like setae over the entire surface.

Subapical lobe.—Divided into two distinct divisions: Distal division with a striated leaf expanded apically arising from branch at base, followed by a rod-like filament, a lanceolate blade, a short acuminate seta, and a curved narrow leaf; basal division with two long, stout rods tipped with flattened, curved points.

Dististyle.—Three-fourths as long as basistyle, curved, basal third narrowed, medially expanded, cap-like, anterior crest with row of short, reflexed setae, a long curved distinctive spine arising from a groove and a smaller eye seta arising below the spine, preapically constricted, apex below terminal claw sharply projected.

Subterminal appendage.—Finger-like, blunt, subapically inserted, longer than terminal claw.

Terminal claw.—Acutely pointed.

DESCRIPTION OF IMMATURE STAGES

LARVA (Plate II): *Head.*—More or less quadrate, broader than long.

Antenna.—Curved, about as long as head, constricted at apical third with portion before constriction spinose and portion beyond constriction darker with heavier spinules, distinctly more slender than basal portion; antennal tuft large, multiple, branches barbed, inserted in constriction at outer third, reaching beyond tip of antenna; papilla short; a short spine, one long terminal, and two long subterminal spines.

Head hairs.—Preantennal (7) multiple, barbed, extending to antennal tuft; lower (6) long, single; upper (5) usually triple, one-half to three-fourths as long as lower head hairs; postclypeal (4) double or triple; sutural (8) multiple; and transsutural (9) triple.

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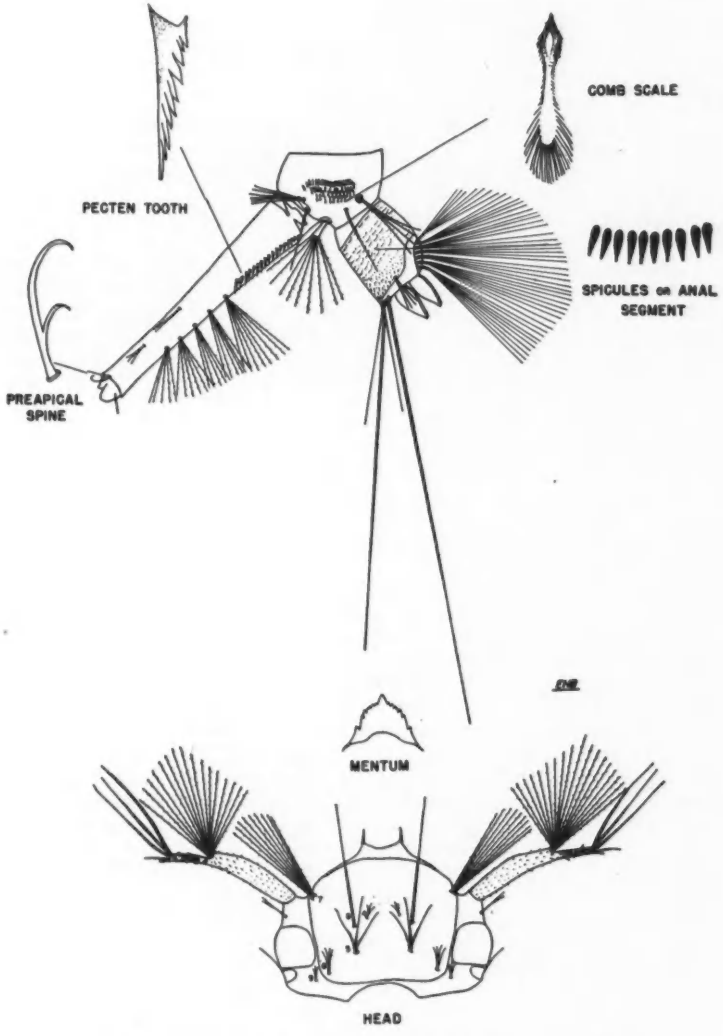
[3]In describing the characters of the male terminalia and the larva the morphological terms used are those employed by Pratt, *et al.* (1945) and Carpenter, *et al.* (1946).



Culex (*Melanoconion*) *mulrennani* Basham. Structures of larva.

Mentum.—Seven teeth on either side of a strong median tooth, the basal three teeth decidedly larger and more remotely placed.

Thorax.—Sparsely spiculated.

Abdomen.—Slightly spiculated.

Upper lateral abdominal hairs.—Usually double on segments I and II, triple on segments III to VI.

Eighth segment.—Sparsely spiculated.

Comb.—Numerous scales (45–55) in a triangular patch of three or four irregular rows, the individual scales rounded, expanded apically, the free portion twice as long as base, fringed from base to apex with subequal spinules.

Hair tufts.—*Alpha* multiple, *Beta* single, *Gamma* large, multiple, barbed, *Delta* single, and *Epsilon* multiple.

Siphon.—Slender, 5½ to 7 : 1, with pecten of 16–20 teeth on basal third, individual pecten tooth fringed on one side to tip; five or six pairs of subventral tufts inserted beyond pecten, basal tuft 1½ to 2 times the width of the base of the siphon; two pairs of double or triple subdorsal tufts; dorsal preapical spine longer than apical pecten tooth, recurved with a smaller recurved spine arising at basal third; a median dark-pigmented band variable.

Anal segment.—Longer than wide, completely encircled by anal plate, spiculated in patterns of 12–16 fine spines in slightly concave rows, dorso-apical spines scattered, heavier; lateral hair 3–4 branched from near base; dorsal brush consists of a long, lower caudal hair and an upper caudal tuft of three hairs (one long and two short) on either side; ventral brush well-developed, posterior to plate; gills normal, shorter than segment, tapered.

PUPA (Plate I): Small, approximately 4 times as long as wide.

Trumpet.—5½ times as long as apical width, edges of apical truncation scalloped with a distinct notch at the base (characteristic of subgenus *Melanoconion*), dark-pigmented band on basal third.

The male runs in Wirth's (1945) key to couplet four or five (*C. abominator* D. & K., *C. peccator* D. & K., and *C. anips* Dyar). From these three species it can be separated by the characteristic shape of the dististyle and the lobes of the ninth tergite (see Plate I). The larva runs in Wirth's (1945) key to couplet six (*C. peccator* D. & K. and *C. elevator* D. & K.), but differs as follows: The mentum has seven teeth on either side of a strong central tooth in *C. mulrennani*, six on either side in *C. peccator*, and five on either side in *C. elevator;* upper head hairs multiple in *C. mulrennani* and *C. peccator*, single or double in *C. elevator*, ½ to ¾ as long as lower head hairs in *C. mulrennani* and ¼ to ½ as long as lower head hairs in *C. peccator;* anal gills shorter than sclerotized plate encircling anal segment in *C. mulrennani*, equal or longer than anal segment in *C. peccator;* comb scale expanded apically, free portion twice as long as base in *C. mulrennani*, not markedly expanded apically, free portion equal to base in *C. peccator*.

Holotype male.—Big Pine Key, Monroe County, Florida, July 26, 1947 (D. C. Thurman, Jr.–E. Basham) deposited in the U. S. National Museum with associated larval and pupal skins. *Allotype female.*—Big Pine Key, Monroe County, Florida, July 26, 1947 (D. C. Thurman, Jr.–E. Basham) deposited in the U. S. National Museum with asso-

ciated larval and pupal skins. *Paratopotype* specimens.—Big Pine Key, Monroe County, Florida, seven males, October 13, 1945 (E. L. Seabrook–A. E. Pritchard), seventeen larvae, January 13–16, 1946 (E. L. Seabrook–A. E. Pritchard–M. W. Provost), three larvae, January 24, 1946 (E. L. Seabrook), nine larvae, January 25–27, 1946 (E. L. Seabrook, R. Krueger–A. J. Obermuller), four larvae, March 12, 1947 (Fred Miller), sixteen larvae, March 17, 1947 (Fred Miller), ten larvae, March 31, 1947 (Fred Miller), twenty-six larvae, April 10, 1947 (D. C. Thurman, Jr.), eight larvae, April 14, 1947 (Fred Miller), and 430 larvae and pupae (three males and three females reared), one male and three females, July 24–30, 1947 (D. C. Thurman, Jr.–E. Basham) are in the collections of the Communicable Disease Center, U. S. Public Health Service, Atlanta, Georgia, and the Florida State Board of Health. *Paratype* specimens.—Cudjoe Key, Monroe County, Florida, one larva, October 15, 1945 (E. L. Seabrook–A. E. Pritchard), two larvae, October 30, 1945 (E. L. Seabrook–A. E. Pritchard–M. W. Provost); Ramrod Key, Monroe County, Florida, seven larvae, November 25, 1946 (Fred Miller), ten larvae, March 6, 1947 (Fred Miller), fourteen larvae, March 12, 1947 (Fred Miller), twenty-one larvae, March 16–17, 1947 (Fred Miller), one pupa (reared male), April 16, 1947 (Fred Miller), and one pupa (reared male), April 19, 1947 (Fred Miller) are in the collections of the Communicable Disease Center, U. S. Public Health Service, Atlanta, Georgia, and the Florida State Board of Health.

ACKNOWLEDGMENTS

The author wishes to thank Dr. Alan Stone, Division of Insect Identification, U. S. Department of Agriculture, and Col. W. H. W. Komp, U. S. Public Health Service, for helpful suggestions and opinions following examination of representative specimens. Further acknowledgments are gratefully extended to Mr. D. C. Thurman, Jr., Entomologist, CDC Activities, U. S. Public Health Service, for guidance and valuable criticism in all phases of the study, and to her associates of the Florida State Board of Health who assisted in collecting and preparing the specimens.

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A NEW GENUS OF BLOODSUCKING PSYCHODIDS FROM PERU[1]

(Diptera: Psychodidae)

MARSHALL HERTIG,
Major, Sanitary Corps, AUS.

In the course of studies on Carrion's disease carried out in Peru (Hertig, 1942) thousands of specimens of Phlebotomus were collected. Most of the field work was done in the verruga zone of the Rimac Valley. The sandfly material included all of the three species known from that region, *P. verrucarum*, *P. noguchii* and *P. peruensis*. Collections were made in houses, caves, excavations, pigpens, etc., both by day and by night. Included in the catches were occasional specimens of a psychodid somewhat larger than any of the local species of sandfly, rather like Phlebotomus in general appearance, but obviously not that genus. The first specimen, an unfed female from Puente Carrion in June, 1937, was successfully fed on a verruga patient. It was over a year, however, before another specimen was taken. At that time, the field work was shifted from Puente Carrion to points farther up the valley, where we began to get one or two specimens per month. The bloodsucking habit was quickly confirmed, since several of the first specimens contained red blood. They were taken in caves and houses along with Phlebotomus. Some were kept alive as long as possible in the hope (never realized) of obtaining eggs. Other live or fresh specimens were dissected or put up for sectioning, or mounted in balsam.

There was much spontaneous interest on the part of the whole staff in this new bloodsucking psychodid. In all our field work we were constantly on the look-out for it and there was considerable friendly competition for the honor of capturing the first male. In spite of this active interest the psychodid continued to be represented only by occasional females. About half of them had fed in nature. In September, 1941, after over four years of continuous collecting, the total was only 34 specimens. At the time of writing there are unfortunately not at hand details of the catches during the next year, but this psychodid continued to be rare until about August, 1942. At that time two members of the staff, Dr. Aristides Herrer and Sr. Maximo Puertas, were trying to locate sandfly breeding-places by searching likely spots at or soon after sundown, when sandflies begin to leave their diurnal shelters. At one spot they caught several of the new psychodids at one time, along with Phlebotomus, particularly *P. peruensis*. One of

[1]This work was begun at the Instituto Nacional de Higiene y Salud Publica, Lima, Peru, and was continued as opportunity permitted while stationed at Gorgas Memorial Laboratory, Panama, as member of a unit of Sanitary Corps officers. The latter phases were carried on under a contract recommended by the Committee on Medical Research between the Office of Scientific Research and Development (the contract having been assumed later by the Office of the Surgeon General) and the Gorgas Memorial Laboratory.

the men was seen to be bitten by the new psychodid as well as by Phlebotomus. No males were found. This was near Matucana in the valley which joins the Rimac just below the town. Here, at a place about one kilometer up the valley and on the south side, an irrigation ditch is carried on top of a stone wall past a shallow concavity in the vertical rocky hillside. This spot, known to our staff as *Acequia Cueva*

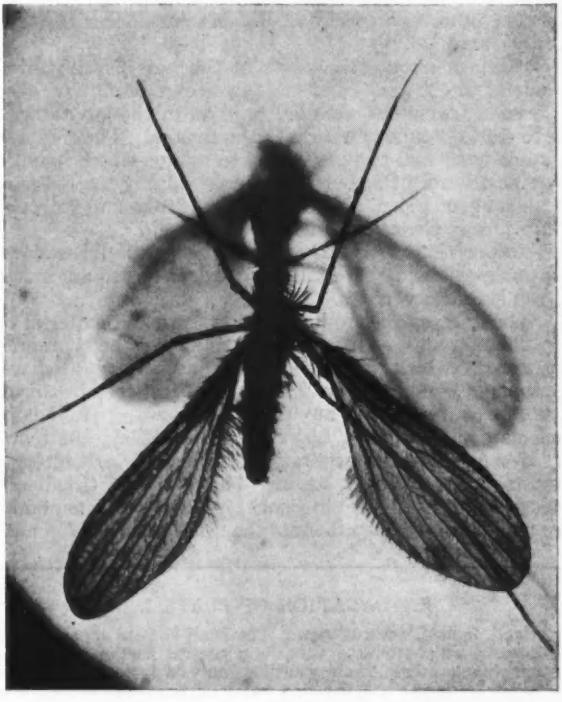


FIG. 1. *Warileya phlebotomanica*, live, unfed female, normal resting position; body and wing scales only slightly rubbed; ×13.5. Compared with Phlebotomus, Warileya is slightly larger and much less hairy. The relatively long, broad and rounded wings are held outward at a greater angle and are more nearly horizontal. For comparison with photographs of several species of Phlebotomus at the same magnification, and for technique of photography, see Hertig (1942).

(ditch cave), was visited repeatedly with the express hope of securing males. All-told, several dozen females were taken, but not until October, 1942, was a male found, when Sr. Puertas sent one alive to the laboratory. Field work was discontinued early in December, 1942, when the writer left Peru. On two subsequent trips to Peru in connection with Army duties, this same place was revisited. In January, 1944, the irrigation ditch had been dry for some time and neither

Phlebotomus nor the new psychodid was found, but in August, 1945, Sr. Puertas caught two males together with about forty females.

The great majority of our specimens have come from Surco and Matucana, i.e., between 2000 and 2400 meters in altitude. Below this level we have taken only six specimens, distributed as follows: Puente Carrion, 2; Lanca, 1; Tornamesa, 1; Huinco (Santa Eulalia valley, 1800 meters), 2. It may be noted that *P. peruensis* is limited to approximately these same altitudes, which mark the upper part of the verruga zone, while the other two species of Phlebotomus occur throughout the whole verruga zone.

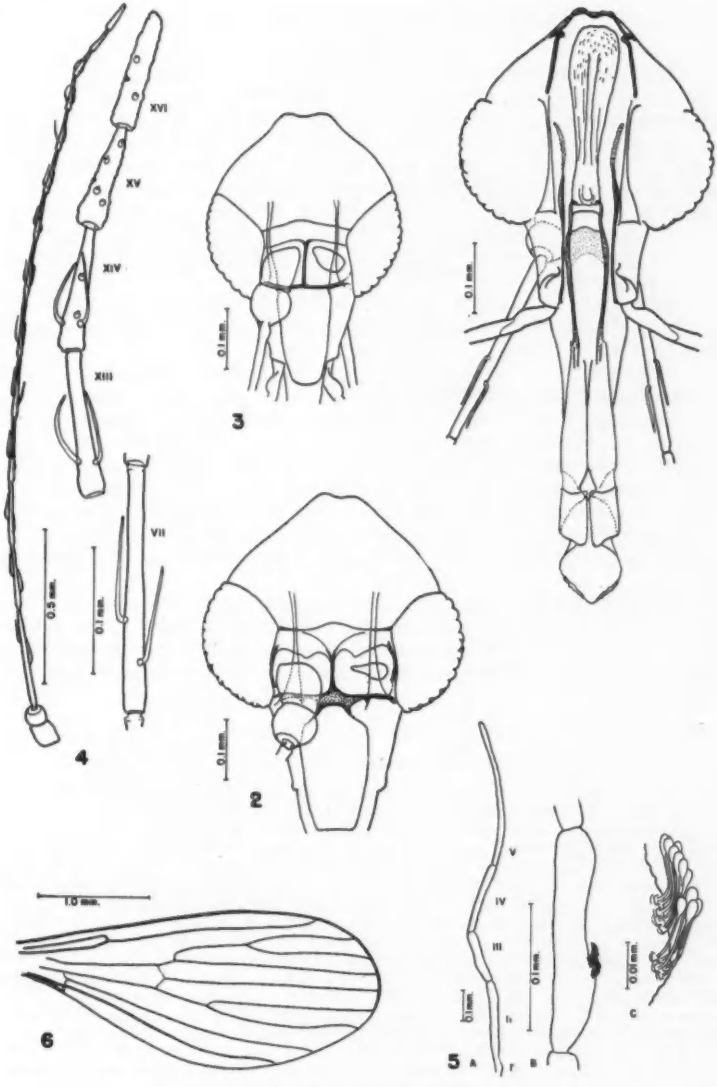
Little is known about the habits of the new psychodid. Man is certainly one of the hosts. In at least two cases biting was observed in nature. Several specimens were fed on man in the laboratory, and 11 out of the first 34 specimens were taken in houses. The rest were taken in caves, stone walls and pigpens. The technique which is successful in inducing oviposition by Phlebotomus, i.e., confining the fed female in a tube with a plug of moist plaster of Paris in one end (Hertig, 1940), failed completely in the case of the new psychodid.

Smears and sections were examined but no experimental work was done with this psychodid. We have no evidence as to any possible role in the transmission of verruga.

We have had access only to limited literature and material of genera other than Phlebotomus. However, a summary of the characters of the psychodid genera which Dr. O. A. Johannsen very kindly, and at considerable labor, provided for us, makes us feel certain that the new sandfly can not be included in any described genus. There is proposed the generic name *Warileya* in honor of W. A. Riley, the teacher and friend of so many of this generation of medical entomologists and parasitologists. The specific name *phlebotomanica* (fond of bloodletting) not only refers to the bloodsucking habit but in embodying the etymology of *Phlebotomus* symbolizes the relation to that genus.

EXPLANATION OF PLATE I

FIG. 1. Head, female, ventral view. The head and its appendages are very similar to those of Phlebotomus. Cibarium: central portion of chitinous arch broad, very faintly sclerotized, sharply outlined only on posterior margin. Cibarial armature limited to numerous very fine hairs (not shown) scattered over the clear area posterior to the chitinous arch; the conspicuous spines, usually found in Phlebotomus, lacking. Fig. 2. Head, female, dorsal view. The frontoclypeal suture is much thicker than in Phlebotomus. Compare with Figure 3. Fig. 3. Head, *P. verrucarum*, female, dorsal view. Compare with Figure 2. Fig. 4. Antenna, with details of certain segments. Number of segments, structure and distribution of ascoids as in Phlebotomus. Fig. 5. A. Palp, five-segmented, Phlebotomus-like; segment III slightly expanded, profile of inner surface with curved depression. B. Segment III, modified scales on inner surface; deciduous scales and fine hairs not shown. C. Segment III, detail of paddle-like, modified scales. There are two compact patches close together, the basal one with about 7 scales, the other with about 24, of which about a third are shown. This same segment in Phlebotomus characteristically bears similar modified scales either scattered or in patches. Fig. 6. Wing, female. The wing is broad with rounded apex, compared with the narrow, pointed wings of Phlebotomus in general; venation essentially the same; bases of R_{2-3} and M_1 faint and with pronounced curve.



Warileya phlebotomanica, gen. et spec. nov.

Drawings made with the aid of the camera lucida, from balsam mounts except as noted.

Warileya phlebotomanica, gen. et spec. nov.
Plates I, II

General appearance, similar to Phlebotomus; slightly larger and much less hairy than most species of that genus; light yellow in color. As seen grossly the most marked differences are in the wings which are relatively very large with rounded apices. They are held outward at a greater angle and are more nearly horizontal than in Phlebotomus. The photograph of a live, normal, unfed female may be compared with those of various species of Phlebotomus, at the same magnification, shown in Plate 5, Hertig, 1942.

In nature Warileya has the same short, hopping flight characteristic of Phlebotomus.

Head (Figs 1–5) closely similar to Phlebotomus, the antennae and palps having the same relative proportions, position and number of segments.

Proboscis as in Phlebotomus. No significant differences in the stylets were noted in the dissection of various specimens.

Antennae (Figs. 1, 4). Ascoids simple, geniculate, on segments III to XIV, extending to distal third of segment.

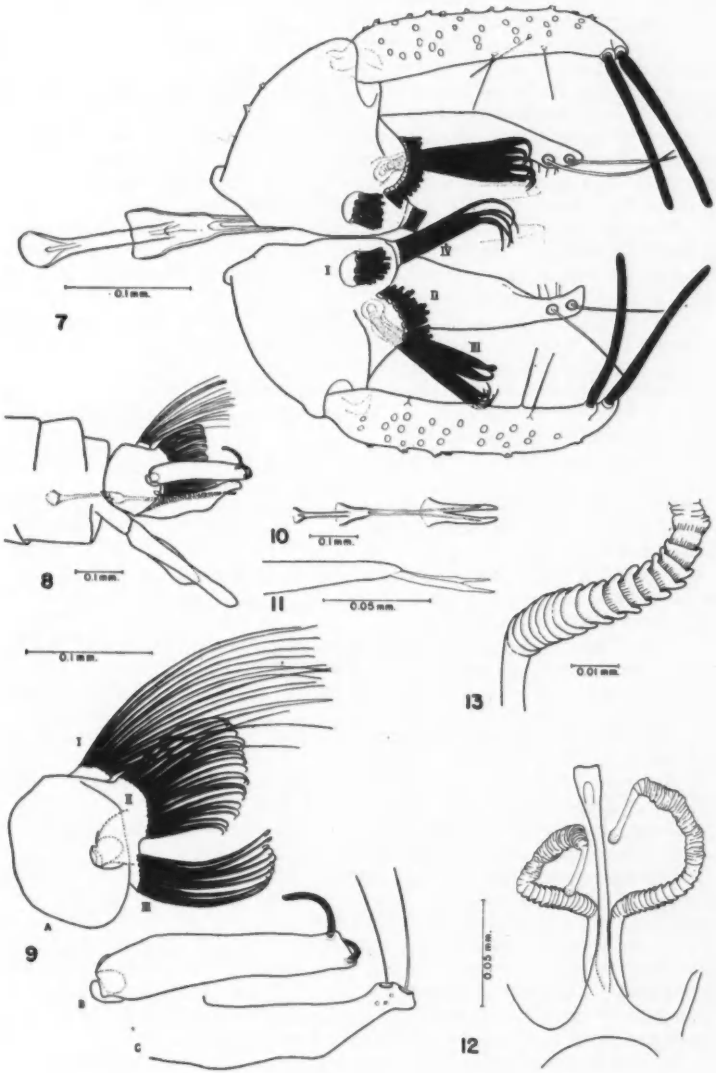
Palps (Fig. 5). Segment III slightly expanded, inner surface with curved depression as seen in profile; two patches of paddle-like, modified scales on inner surface at basal third. Similar modified scales, scattered or in patches, are found on the same palpal segment in Phlebotomus.

Frontoclypeal suture (Fig. 2) much thicker than in Phlebotomus (Fig. 3).

Cibarium, female (Fig. 1). The characteristic *armature* of Phlebotomus (conspicuous spines or teeth) lacking. However, the whole area posterior to the chitinous arch is studded with very fine spines or hairs (not shown in figure), which are more numerous and longer at the sides.

EXPLANATION OF PLATE II

Fig. 7. Male genitalia, dorsal view; phenol mount. The coxites are short, heavy truncated cones extending outward at right angles to the body axis, their dorso-posterior surfaces bearing four tufts of long heavy spines. The dorsal tufts are drawn as though cut off near their bases. The widely separated tips of the aedeagus are indicated by dotted lines. Lateral lobes not shown. Fig. 8. Male genitalia, side view; balsam mount. The lateral lobes arise from a common base, making them Y-shaped in dorso-ventral aspect. Fig. 9. Details, same preparation as Fig. 8. A. Coxite, only three of the four tufts shown. B. Style. C. Paramere. Fig. 10. Genital pump, filaments, aedeagus, dorsal view; same preparation as Fig. 7. Fig. 11. Tips of genital filaments extruded from aedeagus, side view; same preparation as Fig. 8. Exact location of openings not made out. Fig. 12. Spermathecae and part of genital fork, ventral view; balsam mount. The central portion of the spermathecae is composed of conspicuously sclerotized, telescoping annulations; distal portion thin-walled, with irregular trachea-like thickenings; basal part of ducts thin-walled but smooth and sharply defined. In phenol preparations the latter have been seen to empty separately into very thin-walled structures which broaden as they extend toward the posterior edge of the genital fork. Fig. 13. Spermatheca, detail, same preparation as Fig. 12. Each annulation bears on the inner surface a row of very fine hairs. Comparable structures have not been observed in Phlebotomus.


0.1 mm.
7
I
II
III
IV
8
0.1 mm.
10
0.1 mm.
11
0.05 mm.
13
0.01 mm.
0.1 mm.
9
I
II
III
A
B
C
12
0.05 mm.

Chitinous arch heavily sclerotized only at the sides, the central portion a broad, faint band best seen in stained preparations, with only the posterior margin sharply defined.

Pharynx similar to Phlebotomus; posterior portion with folds, some with fine spines.

Wing (Fig. 6) broad with rounded apex, unlike the narrow, pointed wings of Phlebotomus; long in proportion to body length; scales along veins and margin very slender, never obscuring the venation, even in unrubbed specimens. *Venation* essentially the same as Phlebotomus; bases of R_{2-3} and M_1 very faint and with pronounced curve; fork of R_4 and R_5 close to base of R_{2-3}, making *gamma* very short.

Male genitalia (Figs. 7–11) strikingly different from Phlebotomus in general appearance, chiefly on account of the position and shape of the coxites and the enormous tufts which they bear. The structures are best seen in dorso-ventral aspect.

Coxite (Figs. 7–9) short, heavy, conical, extending laterally at right angles to the body and bearing four separate tufts of long, heavy spines on the dorsal and posterior surfaces:

Tuft I, about 20 long, curved spines arising as a compact clump from a circular prominence on the dorsal side and spreading so as to obscure partially the other tufts.

Tuft II, a double row of about 24 heavy spines, curved inward at the tips.

Tuft III, a single row of about eight flattened spines, thin at the edges and curving inward at the tips, arranged like the ribs of a folded fan.

Tuft IV, a single row of about six heavy spines with curved tips, the basal portion apparently fused. This tuft is obscured by the others in both lateral and dorsal view.

Style (Figs. 7–9) slender, cylindrical, with two heavy, apical spines; two or three fine, long, apparently non-deciduous hairs at the distal third.

Paramere (Figs. 7–9) simple, with two long, slender, colorless, dorsal, apical spines and several fine hairs on the inner surface near the apex.

Lateral lobes (Fig. 8) straight, diverging from a common base to form a Y.

Aedeagus (Figs. 7, 8, 10, 11) more deeply divided than in most species of Phlebotomus, the tips rather widely separated.

Genital pump and *filaments* (Figs. 7, 8, 10, 11) as in Phlebotomus.

Female genitalia. *Cerci* similar to Phlebotomus.

Spermathecae (Figs. 12, 13) paired tubes; basal portion smooth, sharply defined, followed by nearly twenty telescoping annulations, conspicuously sclerotized, each annulation bearing on the inside a row of extremely fine hairs; distal portion thin-walled with irregular, trachea-like thickenings, terminating in a straight slender tube with a knob-like expansion. The very fine hairs which, in Phlebotomus, usually radiate from this terminal knob or "head" have not been made out, although there are dot-like structures which could represent their bases.

In phenol mounts, the ducts have been seen to empty separately into two very thin-walled, flat structures which broaden as they extend toward the posterior margin of the genital fork. The details have not been made out.

A comparison with Phlebotomus is difficult since that genus displays a fantastic series of variations of what are fundamentally paired ducts with a common basal portion and ending usually in a marked expansion, which apparently serves as a reservoir, surmounted by a protuberance bearing fine hairs of unknown function. In Warileya the ducts are completely separate and there is no expanded portion. Internal hairs have not been noted in Phlebotomus.

TABLE I

MEASUREMENTS IN MILLIMETERS

Warileya phlebotomanica

	TWO MALES		SIX FEMALES		
			Balsam Mounts		
	Balsam Mount	Temporary Phenol Mount	Max.	Min.	Mean
Body length (thorax + abdomen, excluding ♂ hypopygium)	1.97	1.64	2.49	1.85	2.27
Head—					
Total length, including proboscis	.70	.71	.99	.79	.89
Vertex to anterior margin of clypeus	.43	....	.71	.46	.55
Head, width	.35	....	.44	.29	.37
Eye, length	.17	....	.22	.17	.19
Vertex to eye, lateral profile	.19	....	.21	.18	.20
Antenna, segments III-XVI	1.97	2.14	2.36	1.85	2.16
Segment III	.32	.31	.33	.28	.31
Palp, segments I + II	.25	.26	.38	.29	.33
III	.17	.16	.20	.15	.17
IV	.18	.21	.25	.14	.20
V	.41	.47	.50*	.43*	.47*
Wing, length	2.90	3.04	3.74	3.01	3.40
Width	1.08	1.10	1.43	1.12	1.25
alpha	.79	.78	1.09	.84	.95
beta	.50	.51	.59	.46	.53
gamma	.05	.03	.12	.03	.06
delta	.40	.41	.68	.52	.59

*The fifth palpal segments of the six females measured were somewhat shrunken. For this segment there have been substituted measurements of seven females subsequently mounted with little or no distortion.

Holotype male.—Specimen B, near Matucana, Rimac Valley, Peru, at the "Acequia Cueva" described above, 23 Aug., 45, coll. M. Puertas. Figures 7 and 10 were drawn from this specimen. One other male and at least 25 females were taken on the same occasion.

Allotype female, same place, date and collector as holotype.

Paratypes.—On hand at time of writing (Panama, 1947), all locations in Rimac Valley, Peru, 2 males, 55 females, as follows:

Males: slide, 1 ♂, Matucana, Acequia Cueva, 27 Oct., 42, coll. M. Puertas; in alcohol, 1♂, same place and collector, 23 Aug., 45.

Females: slides: 1 ♀, Puente Carrion, June, 37; 1 ♀, Matucana, Nov., 39; 2 ♀, Surco, 8 Aug., 42; 2 ♀, no data, but same region prior to 1942; 9 ♀ Matucana, Acequia Cueva, 23 Aug., 45. In alcohol: 1 ♀, Matucana, 21 Nov., 39; 1 ♀, Matucana, cave with mouse, 4 Nov., 40; 1 ♀, Rimac Valley before 1942; 1♀, Surco, biting man, 20 Aug., 45, coll. A. Herrer; 2 ♀, Surco, cave, 1 each on 23 and 25 Aug., 45; Matucana, Acequia Cueva, 16 ♀ on 23 Aug., 45, 18 ♀ on 25 Aug., 45, coll. M. Puertas. Where not specified, collectors were the field and laboratory staff or the writer.

Various additional females (labeled Psychodidae-X)were left at the Instituto Nacional de Higiene y Salud Publica, Lima. Since August, 1945, Sr. A. Caballero, Dr. Herrer's assistant, has collected a number of females and at least one male at the Matucana Acequia Cueva, which have been examined in alcohol by the writer.

Types to be deposited in the U. S. National Museum, Washington.

REFERENCES

Hertig, M. 1940. Glass tubes for rearing Phlebotomus and other insects. Science, 92: 91–92.

1942. Phlebotomus and Carrion's disease. Suppl. to Amer. Jour. Trop. Med., vol. 22, No. 5, July, 1942, 81 pp.

INSECTS AND HUMAN WELFARE, by CHARLES T. BRUES. xiii+154 pages, 14 figures, 1947. Harvard University Press, Cambridge, Mass. Price $2.50.

In this small volume Dr. Brues presents an unusually entertaining survey of the relations of insects and some of their arthropod relatives to man. The material included is largely familiar to professional entomologists and should be familiar to all of them, but even they should find it worth reading and useful for the compact presentation of significant data. The reviewer would recommend the book principally to readers who are not specialists in entomology but who are concerned with all matters affecting the welfare of our species. In spite of the remark of an editor some years ago to the effect that people do not like to read about insects, he does not see how anyone could fail to profit by reading this book nor to enjoy it in some degree.

In his brief introduction the author mentions some of the interesting relations of insects to man and the positive value of such species as the lac insects and the honey-bee, and states as his purpose the treatment of the many species which "bear a less pleasant relation to man." These troublesome creatures are discussed in four chapters, headed respectively Insects and the Public Health, Insects and the Food Supply, Forest Insects and Household Insects. A final chapter, The Outlook for the Future, presents briefly an optimistic opinion of our future relations with insects without minimizing the fact that they will continue to be economically important and occasionally serious pests. The figures are graphic representations of statistical data.

Insects and Human Welfare is a worthy addition to the publications of an eminent entomologist and is a fine tribute to his broad information and comprehension of the science.—A. W. L.

NEW NEARCTIC RHYACOPHILIDAE AND PHILOPOTAMIDAE

(Trichoptera)

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Examination of additional collections of Trichoptera from various parts of North America has brought to light several new species, seven of which are described in this paper. To ascertain the placement of the new genus in Philopotamidae, it has been necessary to attempt a tabulation of related world genera, and while the resulting key is preliminary and undoubtedly imperfect, it is presented in the hope that it will be a useful step in an analysis of the family.

I am greatly indebted to Dr. Donald W. Scott, University of Georgia, Atlanta, Ga., and to Mr. Kenneth M. Fender, McMinnville, Ore., for sending me certain of the material used in this paper. Types are deposited in the collection of the Illinois Natural History Survey.

Rhyacophilidae

Rhyacophila parantra n .sp.

This species is a close relative of ***banski*** Ross, agreeing with it in the small aedeagus, incised clasper, and the possession of an apical projection on the ninth tergite. It differs from ***banksi*** chiefly in the shape of this projection. In ***parantra*** the projection extends almost in line with the dorsal contour of the ninth tergite, is much thicker, and is parallel-sided and only slightly incised on the meson. In ***banksi*** Ross, (1944, p. 268, fig. 908 A, B) this projection is set at an angle of nearly 45° to the dorsal line of the ninth tergite, is thinner, and is constricted at the base and more widely excavated at the apex.

Male.—Length 9 mm. General body color various shades of light brown, the lighter shades predominating on the venter; head having a darker brown area covering most of the dorsum; antennae with basal two segments yellow, remainder dark brown; legs yellowish, the spurs darker brown; and wings uniformly light brown with no pattern. General structure, including ocelli, spurs, and venation, typical for genus. Genitalia, fig. 1, distinctive for the species. Ninth segment nearly cylindrical, at the middle nearly a third as long as deep; the posterodorsal portion is produced into a short, straight projection, only slightly raised above dorsal profile of segment, the projection truncate from lateral view, slightly incised mesally from dorsal view, fig. 1A. Tenth tergite having flangelike dorsal projections on lateral lobes, each flange set into the lateral aspect of the lobe and not confluent with the dorsal contour; mesal lobe having a bulbous apex of moderate size. Clasper short and distinctly 2-segmented; basal segment deeper than long; apical segment deeply incised to form a long, sharp dorsal lobe, clothed

with scattered setae, and a longer ventral lobe which is thick, finger-like, and almost spatulate, bearing an inner brush of short black spines. Aedeagus short, its basal part barrel-shaped, the extrusible portion composed of a short dorsal hook and short lateral arms.

Female.—Size, color, and general structure as for male. Structure of segments 8 to 10 very much as for ***banksi*** Ross (1944, p. 268, fig. 908, C, D); eighth segment swollen ventrad, its apical margin sinuate laterad, nearly truncate ventrad, occasionally with a pair of small projections but these not well developed as in ***banksi***.

Holotype, male.—Stream at Twin Lakes, 2 mi. W. of Bloomington, Indiana, May 28, 1947, D. W. Scott. *Allotype*, female.—Monroe State Forest, Morgan, Indiana, May 19, 1946, D. W. Scott. *Paratypes*, all from Indiana.—Same data as for holotype, 9 ♂, 2 ♀, same data as for allotype, 3 ♂, 2 ♀; Blair Springs, Monroe Co., June 4, 1947, D. W. Scott, 2 ♂, 1 ♀; Speed Hollow, Lawrence Co., June 12, 1947, D. W. Scott, 3 ♂, 2 ♀.

All of these specimens have been taken near the source of streams issuing from caves or springs in the limestone area of south-central Indiana. These streams are permanent, cold, and clear, with a fairly rapid flow maintained at all seasons.

As pointed out above, ***parantra*** and ***banksi*** form a closely knit complex of two species. The latter is known only from some of the cold streams of New Hampshire, located about 700 miles from the restricted area from which ***parantra*** is known. This raises the interesting speculation that these two species may have differentiated from each other since the isolation by glacial retreat of similar parental populations in the two areas.

Rhyacophila fenderi n. sp.

In the male, the cut-away ninth segment and deeply concave apical segment of the clasper indicate that among known forms this species is related only to ***perda*** Ross (1938, p. 105, fig. 7). Several striking differences set off ***fenderi***, most prominent of which are the stout mesal projection of the ninth tergite, the extremely reduced dorsal lobe of the clasper, and the curious triangular mesal bodies of the tenth tergite, fig. 3.

Male.—Length 8 mm. Head and body various medium shades of brown, darker dorsad, lighter ventrad; antennae and legs light yellow; wings uniformly light brown, without pattern. General structure typical for genus, including mouthparts, ocelli, spurs, and venation. Genitalia, fig. 3, distinctive for species. Ninth segment cylindrical, nearly twice as long dorsad as ventrad, the posterior margin cut away to form a sharp angle beneath the longer dorsal portion; the dorsum dips down at apex, and from the base of this dip projects a sharp, thin, beaklike process. Beneath this fit the structures of the tenth tergite, which include a pair of large lateral lobes confluent on the meson and a pair of mesal processes that are subtriangular, wide at base, and taper evenly to a very narrow but truncate apex, fig. 3A. Claspers distinctly 2-segmented; basal segment almost rectangular, longer than deep; apical segment with only a minute dorsal lobe but a long, deeply exca-

vated ventral lobe which is rounded at apex and bears a sharp flange around the basal and ventral margins of the excavated area. Aedeagus composed of three sets of elongate parts very similar to those of ***perda***.

Holotype, male.—Peavine Ridge, near McMinnville, Oregon, Aug. 6, 1947, Kenneth M. Fender. *Paratypes*.—Same data as for holotype, but Sept. 13, 1946, 3 ♂.

Rhyacophila ophrys n. sp.

The general conformation of the tenth tergite and the unindented apical segment of the clasper show a close relationship between this species and ***abchasica*** Martynov, described from a mountainous torrent in Abkhasia. In ***ophrys*** the apical segment of the clasper is shorter than deep and ovoid, and the dorsal lobes of the tenth tergite are separated on the meson by a wide "V;" in ***abchasica*** the apical segment of the clasper is longer than deep, the ventral corner is angulate, and the whole trianguloid, and the dorsal lobes of the tenth tergite are contiguous almost to the apex.

Male.—Length 8.5 mm. Color of body and all the appendages reddish brown, remarkably uniform in shade throughout, only the venter and a few of the leg joints lighter. General structure typical for genus. Genitalia as in fig. 4. Ninth segment cylindrical, nearly twice as long dorsad as ventrad, the posterior margin gently sinuate, the postero-dorsal portion suddenly curved downward so that the tenth tergite attaches to it some distance below the dorsal margin. Tenth tergite having lateral lobes forming a pair of dorsal shelves separated by a deep, V-shaped cleft, fig. 4A; on the under side of each shelf is a sharp curving ridge which rounds into the base of the shelf. The mesal lobes of the tergite form a short, straight internal rod and end in a round reticulate area. Claspers distinctly divided into two segments; basal segment considerably longer than deep, slightly narrowed just beyond base, but otherwise nearly parallel-sided; apical segment deeper than long, none of the corners angulate, the whole forming an ovoid structure. Aedeagus short, consisting of a short outer "barrel;" a short, slender, spikelike mesal piece; and a pair of flat lateral flaps, the long dimension dorso-ventral in position, the apical portion bearing a large, mesal, brushy area.

Female.—Size, color, and general structure similar to male. Genital segments relatively short. Eighth segment having dorsal length subequal to depth, the ventral length longer due to the production of the ventro-mesal portion into a rounded apical portion; lateral aspect having apical margin evenly sinuate.

Holotype, male.—East of summit of Logan Pass, Glacier National Park, Montana, July 12, 1940, J. A. and H. H. Ross. *Allotype*, female.—Same data as for holotype. *Paratypes*.—Same data as for holotype, 21 ♂, 23 ♀.

Rhyacophila belona n. sp.

The projecting, parallel-sided, and cleft tenth tergite, fig. 2A, allies this species with ***vetina*** Milne and the ***angelita*** group. From the latter ***belona*** differs in lacking a pair of extensile pads on the aedeagus and in

the sinuate lateral aspect of the tenth tergite. From *vetina*, *belona* differs in the trapezoidal apical segment of the clasper and the sinuate dorsal margin of the tenth tergite. In *vetina* the apical segment of the clasper is incised and shoe-shaped.

Male.—Length 10.5 mm. Color of entire body and appendages reddish-brown except for the extreme base of each tarsal segment which is whitish. Genitalia as in fig. 2. Ninth segment cylindrical, the dorsal length nearly twice the ventral length, the apico-lateral margin oblique and nearly straight. Tenth tergite elongate, parallel-sided, and shelflike, fig. 2A, sinuate in lateral view with a large ventral lobe near base, and cleft about halfway down the meson, the cleft nearly closed at apex but elliptic at base. Clasper distinctly 2-segmented, the basal segment straight sided and tapering slightly to apex, nearly as long as tenth tergite, and the apical segment trapezoidal with a round apico-ventral corner. Aedeagus having a broad, short basal portion and a long, central, projecting, sclerotized process which is flanged on its basal half and spikelike apically.

Holotype, male.—East of summit of Logan Pass, Glacier National Park, Montana, July 12, 1940, J. A. and H. H. Ross.

This and the preceding species were swept from shrubbery along a small, rocky, mountain cascade at an elevation of about 6000 feet.

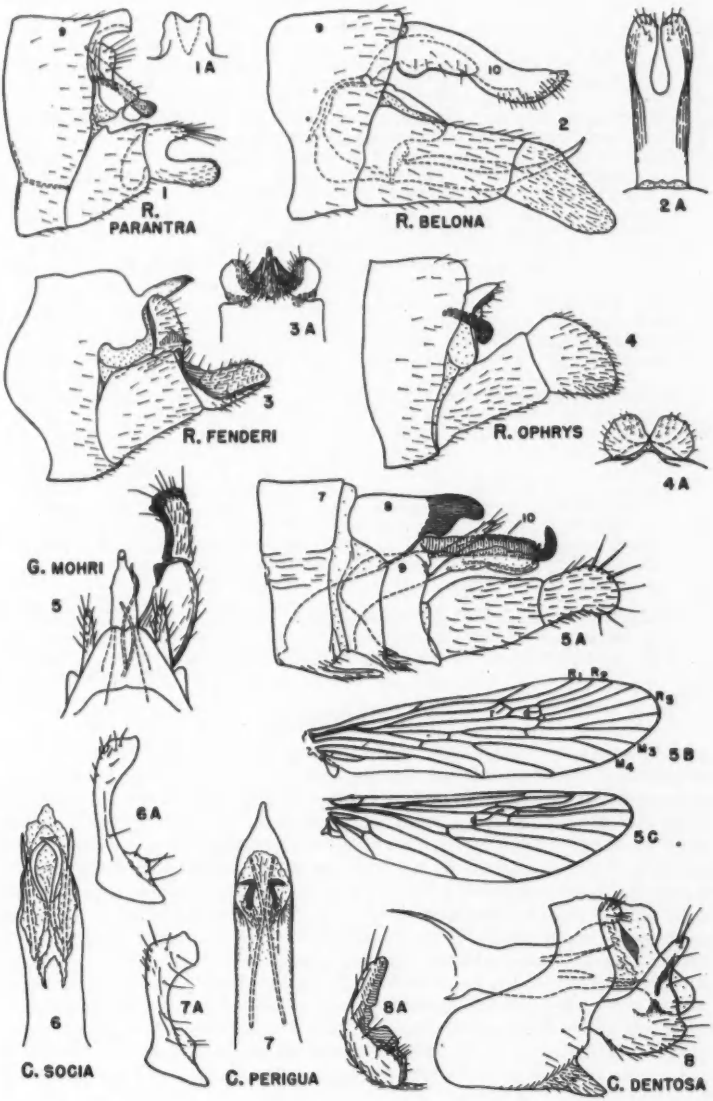
Philopotamidae

The family Philopotamidae appears to be a small, compact family of world wide distribution, and contains relatively few described genera. An analysis of these on the basis of male genitalia brings out an interesting set of conditions: in *Chimarra* the clasper is 1-segmented, in *Philopotamus* the clasper is 2-segmented and has an additional sausage-like appendage on the apical segment, and in the remaining genera the clasper is 2-segmented with no additional major divisions. This latter group is surprisingly uniform in the general type of genitalia exhibited, but appears to be divisible into several generic types substantiated by both wing venation and larval and pupal characters, in cases in which the latter are known.

Based on illustrations of the labrum, *Philopotamopsis* Iwata (described from larvae) appears not to belong to this family.

EXPLANATION OF PLATE I

Fig. 1. *Rhyacophila parantra*, male genitalia, lateral aspect. 1A, tenth tergite, dorsal aspect. Fig. 2. *Rhyacophila belona*, male genitalia, lateral aspect. 2A, tenth tergite, dorsal aspect. Fig. 3. *Rhyacophila fenderi*, male genitalia, lateral aspect. 3A, tenth tergite, dorsal aspect. Fig. 4. *Rhyacophila ophrys*, male genitalia, lateral aspect. 4A, tenth tergite, dorsal aspect. Fig. 5. *Gatlinia mohri*, male genitalia, dorsal aspect. 5A, same, lateral aspect. 5B and C, front and hind wings. Fig. 6. *Chimarra socia*, aedeagus, dorsal aspect. 6A, clasper, posterior aspect. Fig. 7. *Chimarra perigua*, aedeagus, dorsal aspect. 7A, clasper, posterior aspect. Fig. 8. *Chimarra dentosa*, male genitalia, lateral aspect. 8A, clasper, posterior aspect.


9
1A
1
R. PARANTRA
9
10
2
R. BELONA
2A
3A
3
R. FENDERI
4
R. OPHRYS
4A
G. MOHRI
5
7
8
10
9
5A
R1 R2
R5
M3
M4
5B
5C
6A
6
7A
7
C. SOCIA
C. PERIGUA
8A
8
C. DENTOSA

KEY TO GENERA

1. Wings reduced to small, inconspicuous stubs. Some females of **Dolophilodes** Ulmer
   Wings well developed, reaching beyond apex of abdomen 2
2. Front tibia having one apical spur or none ..... **Chimarra** Stephens
   Front tibia having two apical spurs 3
3. Front wing having M_{3+4} unbranched ..... **Wormaldia** McLachlan
   Front wing having M_{3+4} branched into M_3 and M_4, fig. 5B 4
4. Front wing, fig. 5B, having Sc and R_1 sinuate, touching or nearly touching at base of stigmal area. Both wings having discoidal cell (d) very small; branches of R_s crowded close together, especially in hind wing. Hind wing, fig. 5C, with tips of R_1 and R_s meeting ..... **Gatlinia** new genus
   Front wing having Sc and R_1 nearly straight, never close to each other. Hind wing with tip of R_2 distant from tip of R_1 5
5. Front wing having R_{2+3} simple, without a fork ..... **Dolophilus** McLachlan
   Front wing having R_{2+3} divided into R_2 and R_3 6
6. Front wing with fork of R_{2+3} almost directly above that of R_{4+5} 7
   Front wing with fork of R_{2+3} considerably distad of that of R_{4+5} 9
7. Maxillary palpus very long, having segment 4 subequal in length to 1 and 2 together, and segment 5 three times length of 4. Australian species, **Hydrobiosella** Tillyard
   Maxillary palpus shorter, having segment 4 subequal to 2 only, and segment 5 usually only twice length of 4. African and holarctic species 8
8. Discoidal cell subequal in length to cell R_2; cross-vein *r* situated basad of fork of R_{2+3}, and considerably basad of discoidal cross-vein. African species ..... **Thylakion** Barnard
   Discoidal cell little more than half length of cell R_2; cross-vein *r* situated at fork of R_{2+3}, and only slightly basad of discoidal cross-vein. Species of holarctic region ..... **Dolophilus** McLachlan
9. Male clasper having a tubular, finger-like appendage arising from base of apical segment and as long as this latter segment; female eighth segment cylindrical and forming a ring of nearly equal length at all points, **Philopotamus** Leach
   Male clasper 2-segmented but with no appendage; female eighth segment having its apico-ventral margin deeply incised, so that the ventral length of the segment is only a third or a fourth of the lateral length, **Dolophilodes** Ulmer

Genus **Gatlinia** nov.

Characteristics.—General structure typical of the family Philopotamidae, as follows: head having three large ocelli, the lateral ones separated by twice their width from margin of eye; maxillary palpi 5-segmented, the first, second, and fourth subequal, the third nearly twice as long as the fourth, the fifth nearly three times as long as the fourth and much narrower, but without suture-like cross-striae typical of many Philopotamidae. Tibial spur count 2–4–4, the spurs on the front tibia much shorter than the others. Front wing, fig. 5B, following in general the venation of other members of the family, with the following salient characteristics: Sc_2 deeply bowed near apex, R_1 curved sharply forward at the same point, the two either touching or nearly so at this point; R_{2+3} and R_{4+5} both branched, discoidal cross-vein close to main branch of R_s so that discoidal cell is short; R_{2+3} branching either at discoidal cross-vein, fig. 5B, or some distance beyond it; M having all four branches distinct. Hind wing, fig. 5C, having several modifications from the generalized type for the family, as follows: branches of R_s crowded together; R_2 curving upward and fusing with tip of R_1; R_{2+3} branched some distance beyond discoidal cross-vein; discoidal cell

very small; venation posterior to this not at all crowded and typical for group.

Genotype.—*Gatlinia mohri* n. sp.—This genus is most closely related to *Dolophilus*, but differs from it in venational characters mentioned in the key. The female has the eighth segment sclerotized and short, suggesting an affinity to *Dolophilodes*, from which *Gatlinia* differs in the short discoidal cell and crowded condition of R_4 in the hind wing.

Gatlinia mohri n. sp.

The male genitalia of this species resemble in general pattern those of species of *Dolophilus* and *Dolophilodes*, but differ from all of them in the heavily sclerotized and hoodlike projection of the eighth tergite.

Male.—Length 7 mm. Color of body and appendages various shades of medium brown, the legs and venter paler and yellowish. General structure as outlined for genus. Seventh sternite having a broad, tongue-like, apico-mesal flap that is as long as the segment; eighth sternite having a similar but shorter and slightly narrower flap. Eighth tergite having its apical margin produced into a long, wide, sclerotized hood extending over the ninth and base of the tenth tergites. Genitalia as in figs. 5 and 5A. Ninth segment triangular from side view, the tergal portion greatly reduced; the tenth tergite is contiguous with it and forms a long, mesal, sclerotized process that is upturned at apex to form a stout hook and has on each side a serrate flange; at the base of the tenth tergite arise the finger-like cerci. Claspers distinctly 2-segmented; the basal segment is one and a half times the length of the apical one and slightly swollen near base; the apical segment curves slightly ventrad and mesad, is armed with a few long, lateral setae at apex, is smooth and concave mesad, and bears along its apical face a series of rows of short, stout black pegs together giving the appearance of a dense brush. Aedeagus mostly membranous, tubular inside the body and having membranous folds at the apex, bearing also two long, sinuate, slender sclerotized rods which may extrude from the apex.

Female.—Similar in size, color, and general characteristics to male. Seventh segment large and slightly bilaterally compressed, bearing a short baso-mesal projection on venter. Eighth segment small, sclerotized laterally, and having a narrow ventro-mesal line which is only semi-sclerotized. Ninth and tenth segments also short, only the extreme base of the ninth sclerotized. Eighth and ninth segments each having a pair of rodlike apodemes arising from base and extending internally towards the anterior part of the abdomen.

Holotype, male.—Smokemont, North Carolina, May 11, 1944, Frison and Ross. *Allotype*, female.—Same data. *Paratypes.*—Tennessee: Gatlinburg, along Little Pigeon River, June 13, 1940, Frison *et al*, 1 ♂, 3 ♀; May 11, 1944, Frison and Ross, at lights in town, 2 ♂; May 11, 1944, Frison and Ross, along Little Pigeon River, 8 ♂, 6 ♀.

The specimens collected at Gatlinburg in 1940 and at Smokemont in 1944 were obtained by sweeping foliage along the rapid mountain streams mentioned. The larger Gatlinburg collection made along the Little Pigeon River on May 11, 1944, was taken while searching primarily for stoneflies among the rocks along the stream bed. Earlier in

the morning no caddisflies were in evidence, but about noon a bank of rainclouds rolled in, causing an extremely high humidity which combined with the warm spring temperature to produce stifling and, to the collectors, uncomfortable conditions. Almost immediately caddisflies appeared in great numbers on the rocks of the stream bed, running and flitting about with great alacrity. We had time to pick up only a small collection of the caddisflies before a torrential downpour dissolved the insect band and brought an end to collecting.

Genus **Dolophilodes** Ulmer

Dolophilodes Ulmer, 1909, Notes Leyden Mus. *30*: 125. Genotype, monobasic.—*D. ornata* Ulmer.

Trentonius Betten & Mosely, 1940, Francis Walker Types of Trichoptera in the Brit. Mus.: 11. Genotype, by original designation—*Philopotamus distinctus* Walker.

When the genus *Trentonius* was originally described, only apterous females were known for the genotype, *distinctus*, and this characteristic was one of the main considerations in segregating the genus. Later discovery of normally winged females during summer generations of that species has reopened the question of the relationship between *Dolophilodes* and *Trentonius*. A comparison of Old and New World members of the complex shows that *ornatus* Ulmer, *distinctus* (Walker), and *aequalis* (Banks) form one of the most closely knit groups of species in the entire assemblage. As a matter of fact, *ornata* resembles *aequalis* very much as regards male genitalia. Ulmer illustrates *ornata* as having R_{2+3} unbranched in the hind wing; in *distinctus* and other nearctic species this vein is branched; but in *aequalis* the vein is branched in some specimens, unbranched in others. It would appear therefore that in this case similarities indicated by male genitalia are of more significance than those based on venation.

On this basis the genus *Trentonius* is here considered a direct synonym of *Dolophilodes*, to which must be transferred the American species listed under *Trentonius* by Ross (1944).

Genus **Chimarra** Stephens

At this time I wish to draw attention to the omission from my 1944 Checklist of a species described as *Wormaldia Buenoi* by Navas (1934, Broteria, Lisbon, n. ser. *3* (old ser. 30): 83, fig. 49) from Yaphank, L. I., N. Y. I have seen no type material of this species but it seems highly probable that Navas' material belonged to *C. aterrima* (Hagen). Navas illustration of the front wing is typical of *Chimarra* and also lacks a sharp angulation and knot at the fork of R_s. This knot is typical of species such as *obscura* (Walker); of the species known from New York it is absent only in *aterrima*.

I am tentatively considering both *Curgia* Walker and *Cabreraia* Enderlein as subgenera of *Chimarra*.

Chimarra perigua n. sp.

This species is a close relative of *socia* (Hagen), and will run to it in recent keys. It differs in the more expanded apex of the clasper and

the hooked inner rods of the aedeagus, fig. 7. In *socia*, fig. 6, the apex of the clasper is much more slender, and the inner pair of rods of the aedeagus are elongate and gently sinuate.

Male.—Length 7 mm. Color of body and appendages dark brown, almost black, the front legs and the portion of the middle and hind legs beyond the femora creamy white with the spurs brown. General structure typical for genus. Genitalia in general proportions similar to those of *socia*. Ninth segment narrow and sinuate, bearing a short, spatulate ventral process on the meson. Clasper elongate, fig. 7A, from posterior view having a broad base, a slender central portion, and an expanded apex curved mesad. Aedeagus with apex tubular, fig. 7, and bearing two pairs of sclerotized rods which evert dorsad, a short, stout pair that curve sharply laterad to form a stout hook, and a long, straight, slender pair.

Female.—Length 8 mm. Color and general structure as for male. Genitalia having ninth tergite constricted near apex to form a short apical collar; this character differentiates *perigua* from all other eastern members of the genus except *socia*, and from this species no satisfactory differences have yet been found.

Holotype, male.—Santa Fe River, Alachua Co., Florida, April 6, 1940, L. Berner. *Allotype*, female.—Santa Fe River at Poe Springs, Alachua Co., Florida, March 12, 1938, L. Berner. *Paratypes.*—Florida: same data as for allotype, 1 ♂. Georgia: Spring Creek, Decatur Co., August 20, 1946, P. W. Fattig, 2 ♂, 28 ♀. Echenonee Creek, Macon, May 5, 1939, P. W. Fattig. Illinois: Momence, along Kankakee River, May 26, 1936, H. H. Ross, 2 ♂; June 1, 1937, B. D. Burks, 1 ♂; September 7, Frison & Ross, 1 ♂.

The above records of this species collected from 1936 to 1940 were originally recorded erroneously as *Chimarra socia* in the "Trichoptera of Illinois" (Ross, 1944), and *socia* should be deleted as being recorded from Florida, Georgia, and Illinois. Re-examination of large series of *socia* shows that other records of *socia* given in that paper stand, thus indicating a wide eastern and northeastern range for *socia* and a small range for *perigua* which is peripheral on the southern and western portions of the range of *socia*.

Chimarra dentosa n. sp.

The sinuate ninth segment, the reduced nature of the ninth tergal region, and the triangular clasper place this species in the *aterrima* group, within which it seems most closely related to *angustipennis* Banks. From this species, *dentosa* differs in the slender dorsal projection of the clasper and the beaklike apex of the tenth tergite, fig. 8. From *ridleyi* Denning, another close relative, *dentosa* differs most conspicuously in the shape of the tenth tergite and the presence of sclerotized ridges on the mesal face of the clasper.

Male.—Length 6 mm. Color of body and appendages medium brown, the venter and legs lighter, shading to yellowish. General structure typical for genus. Genitalia as in fig. 8. Ninth segment sinuate, the dorsal portion semimembranous and merging imperceptibly with the tenth tergite, armed ventrad with a large, stout,

pointed process. Cerci small, round, and almost without a basal stalk. Tenth tergite chiefly membranous, with a small basal flange just below and in front of cercus, and with the apico-lateral lobes beaklike and only moderately sclerotized. Clasper more or less triangular from lateral view, the dorsal portion forming a long, slender finger, the posteroventral angle projecting only slightly, and the ventral margin arcuate; the mesal face of the clasper, fig. 8A, bears a series of sclerotized ridges running from top to bottom, the upper two ridges low and looking like a knife edge from posterior view, the lower ridge short but more projecting and cusplike; the position of these ridges from lateral view is shown by broken hatching in figs. 8 and 8A. Aedeagus semimembranous and tubular, enlarged slightly at apex and flared at base; internally there are three sharp slender rods.

Holotype, male.—Apatzingan, Michoacan, Mexico, elevation 1200 feet, Aug. 12, 1941, H. Hoogstraal. *Paratypes*.—Same data, 11 ♂.

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Betten, Cornelius, and **Martin, E. Moseley.** 1940. The Francis Walker types of Trichoptera in the British Museum. 248 pp., 122 figs. London.

Ross, Herbert H. 1938. Descriptions of nearctic caddis flies. Ill. Nat. Hist. Surv. Bull. 21 (4): 101–83. 123 figs.

1944. The caddis flies of Illinois. Ill. Nat. Hist. Surv. Bull. 23 (1): 1–326. 961 figs.

CATALOGUS HESPERIDARUM REI PUBLICAE COLOMBIANAE, by KENNETH J. HAYWARD. Acta Zoologica Lilloana of the Instituto Miguel Lillo, Vol. IV, pages 201–392, 1947.

During the past five years several catalogues of the skippers of South American countries have appeared, namely, for Ecuador by Roswell C. Williams, Jr., and Kenneth J. Hayward; for Venezuela by E. L. Bell, and the title mentioned above. While it would be desirable to have a catalogue of the species of the entire continent the difficulty of the group and the constant addition of new names are obstacles which can be overcome only by long and careful study. The excellent work of Bell and Hayward continues to advance our knowledge of the skipper fauna but it is obvious that much remains to be done. Under these conditions the regional catalogues are tremendously helpful.

Like those previously published, this catalogue has an excellent and practical format. Taxonomic categories and species are printed as bold-face headings. Synonymy of the categories with original references clarifies the status of names. Under species the synonymy with references for original descriptions is supplemented by additional references including notation of illustrations of the insects and their genitalia. This compilation of material will be of inestimable value to those who have had to struggle with the widely scattered literature of the group.—A. W. L.

DESCRIPTION OF A NEW TIGER BEETLE FROM TEXAS

JOHN H. ROBINSON,
Shreveport, Louisiana

There has always been a noticeable correlation between the color patterns of some tiger beetles and their habitats. For example, *C. lepida* Dejean prefers white sand, as does *C. saulcyi* Guérin. *C. formosa* Say, on the other hand, is usually encountered on red sand and red clay. *C. belfragei* Sallé frequents black loamy ground, while *C. vulturina* LeConte is most common in burnt-over brush and on black dirt roads.

For this reason it seemed to be of especial ecological interest to discover an apparently new variety of *C. repanda* Dejean in a field consisting largely of black loam, a type of habitat where this species is not usually found.

In general appearance this specimen is narrower than the typical *repanda*, with the sides of the elytra more nearly parallel. Presented below is a table indicating the notable differences between the typical *repanda* and its varietal form *maehleri*.

Cicindela repanda Dejean

Color:
elytra bronzed, foveae green; thorax bronzed, alutaceous, broader at apex, as wide as long; humeral umbone distinct; femora, tibiae and tarsi bronzed; antennae bronzed; under surface bronze, green and blue.
Average length: 12–14 mm.
Average width: 5–6 mm.

Cicindela repanda maehleri var. nov.

Color:
elytra dull black, foveae entirely lacking, in their stead are slightly raised surfaces; thorax dull black, alutaceous, parallel, longer than wide; humeral umbone barely in evidence; femora black, tibiae and tarsi ferrugineous, antennae piceous; under surface opaque black.
Length: 11 mm.
Width: 4 mm.

Holotype: male, in author's collection (Brazos County, Texas, IV–13–35). The taxonomist must bear in mind that one frequently finds small specimens of *C. repanda* Dejean which are blackish in appearance. After examination of several hundred specimens, however, the writer found them all to possess the definite metallic bronzed lustre common to most species of this genus.

It is with great respect that this *varietas novum* is dedicated to Mr. Kenneth L. Maehler of Berkley, California, a true, ardent and capable entomologist.

CHREMYLUS RUBIGINOSUS (NEES.), A BRACONID PARASITE OF THE CASEMAKING CLOTHES MOTH

HORATIO C. MASON,[1]

Bureau of Entomology and Plant Quarantine,
Agricultural Research Administration,
United States Department of Agriculture

In October, 1931, several specimens of the hymenopterous parasite of the family Braconidae were taken by the writer from larvae of the casemaking clothes moth, *Tinea pellionella* (L.), that were collected from a wool warehouse in Columbus, Ohio. The parasites were identified by C. F. W. Muesebeck, of the Bureau of Entomology and Plant Quarantine, as *Chremylus rubiginosus* (Nees.).

Since little has been published on this parasite, it is believed that the data collected may be of interest.

Some of the investigations on the effect of temperature and relative humidity on the biology of the parasite were conducted in control cabinets that were being used for studies of another insect. Therefore it was not always possible to maintain the temperature and relative humidity at a point most desired for the study of this parasite.

HOST RELATIONS

According to Marshall (3, pp. 76, 77), Curtis reports *Chremylus rubiginosus* (Nees.) as being a frequent parasite of *Bruchus rufimanus* Boh.; Rondani bred it from *Bruchus seminarius* L.; Taschenberg lists it as a parasite of *B. granarius* Sch.; and Brischke had bred it from cases of *Tinea pellionella* L. Teichmann and Andres (4) report it as being a parasite of *Calandra granaria* L. (now *Sitophilus granarius* (L.)). Curtis (1, p. 365) frequently found it with *B. granarius* and states: "It is also serviceable in destroying wood-boring beetles which infest our houses."

Additional host records cited in literature, according to records in the Division of Insect Identification, Bureau of Entomology and Plant Quarantine, are as follows: *Sitophilus oryza* (L.), *Tinea granella* L., *Ephestia kuehniella* Zell., *Bruchus lentis* Froel., *Bruchus atomarius* (L.), *Ernobius abietis* (F.), *Ernobius angusticollis* Rtzb., *Ernobius longicornis* Sturm., and *Ernobius mollis* (L.). All the records are apparently European.

The authenticity of some of the host records may be questionable, as a few records show no indication of the parasites being reared from isolated material.

[1]Acknowledgments are due to the following members of the Bureau of Entomology and Plant Quarantine: B. J. Landis, for many helpful suggestions and for the drawing of the adult; N. F. Howard, for helpful suggestions; and to R. W. Brubaker, G. V. Johnson, and J. W. Apple, for assistance rendered from time to time. Thanks are also due to Alvah Peterson, of Ohio State University. Many of the data were obtained while the writer was doing graduate work at this University.

SYNONYMY

Synonymy has been published by Dalla Torre (2).

DESCRIPTION OF STAGES

ADULT

(Fig. 1)[2]

"*Female.*—Length about 2 mm. Head narrower than thorax, less than one and one-half times as broad as long; face much broader than long, face, frons, and vertex rugulose punctate; temple strongly convex, nearly as broad as eye; antennae 12-segmented, about as long as head

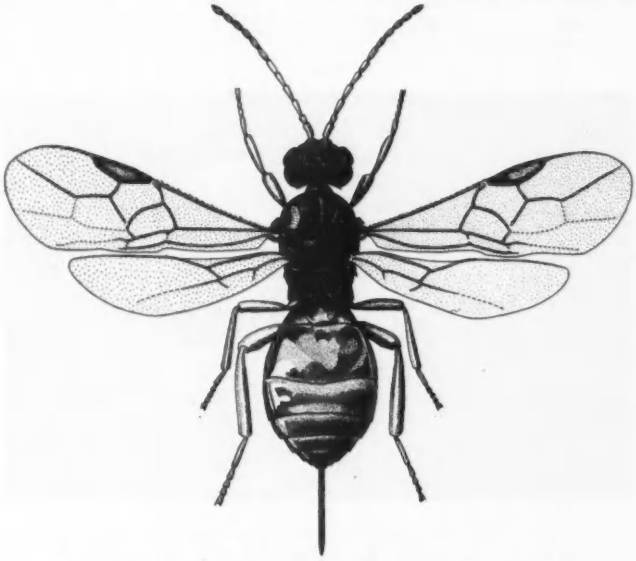

FIG. 1. Adult parasite, *Chremylus rubiginosus* (Nees.). Approximately 23×.

and thorax combined; occiput completely sharply margined. Thorax slightly broader than high; mesoscutum rather flat; notaulices complete, fine, not foveolate, middle lobe with a median longitudinal impression posteriorly; middle and lateral lobes coriaceous, the lateral ones more weakly so than the middle lobe; scutellar furrow very broad, coarsely foveate; scutellum flat, nearly smooth (only faintly reticulate); propodeum rugose, areolated, the diamond-shaped median area extending from near base to extreme apex and provided with transverse rugae;

[2]The descriptions of the adult (male and female) were supplied by C. F. W. Muesebeck in a letter to the author.

mesopleuron mostly smooth, with some rugosity anteriorly above and a short, longitudinal, foveolate furrow below; metapleuron rugose; first abscissa of radius as long as width of stigma; recurrent vein interstitial or entering base of second cubital cell; nervulus strongly postfurcal; cubitus obsolescent apically; radial cell extending to extreme apex of wing; second cubital cell, measured on cubitus, nearly or quite as long as third; submediellan cell less than half as long as mediellan; radiella wanting; calcaria of posterior tibia very short; posterior tarsus shorter than tibia. Abdomen broader than thorax, depressed, broadly sessile; first tergite much broader at apex than long, finely granular and with two prominent dorsal longitudinal keels delimiting a parallel-sided median area; suturiform articulation not indicated, the large connate second and third tergites largely finely reticulate or coriaceous, smooth laterally and along posterior margin; the following tergites smooth and polished. Ovipositor sheath about half as long as abdomen.

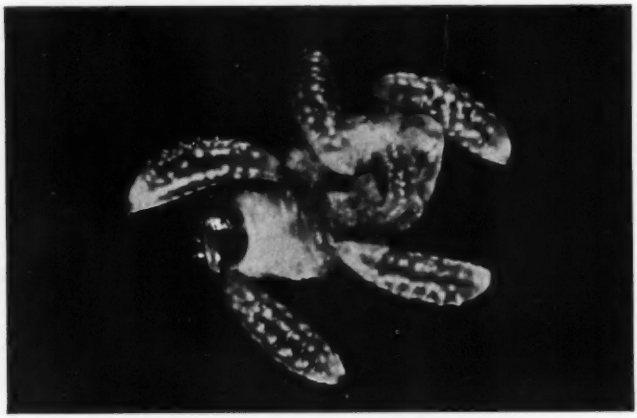

FIG. 2. Nearly full-grown larvae of *Chremylus rubiginosus* with remains of host. Approximately 10×.

"Brown; vertex and occiput black; thorax more or less piceous; legs including coxae brownish yellow; wings hyaline, stigma dark brown."

"*Male.*—Essentially like the female, but more weakly sculptured, especially on vertex of head and on abdomen."

Egg.—The eggs vary somewhat in shape, but in general are slightly curved, larger and more rounded at the cephalic than at the caudal end. The shell has a smooth appearance to the naked eye, but under a microscope appears to be slightly pebbled. When first laid the eggs are glossy, pearly white, and slightly translucent. As incubation progresses, they clear until, prior to hatching, examination under a binocular often reveals the outline of the embryo inside, and slight movement may be detected.

Measurements made on 105 individuals showed a variation in size

ranging from 0.40 to 0.51 mm. in length and from 0.08 to 0.13 mm. in width at the widest part, the average length being 0.45 mm. and the average width 0.11 mm. If any change in size occurs during incubation, there is a slight decrease.

Larva.—The body of the newly hatched larva is larger and more blunt on the anterior end, gradually tapering toward the posterior end. As development progresses the larva thickens through the center, tapering toward both ends. The nearly full-grown larva appears somewhat elliptical in shape when viewed dorsally and crescent in shape when viewed laterally, with distinct ridges extending over several of the middle body segments in a plane perpendicular to the long axis of the body (fig. 2).

In color the larva ranges from crystal-like appearance when newly hatched, through an off-white to a rather deep caramel shade in some larvae in the late instars. All stages are more or less translucent.

The body is composed of 13 segments and a head, with antennae present on all instars. Light flakelike areas are soon evident in the body of the young larva, becoming prominent in the late instars. The fifth, or last, instar is thickly covered with spines on all segments except the head and caudal segment.

The entire larval period of five instars is spent externally on the host. Normally there is only a slight change in location during the greater part of development.

The average dimensions of the larvae measured are shown in Table I.

TABLE I

AVERAGE DIMENSIONS OF DIFFERENT LARVAL INSTARS OF *Chremylus rubiginosus*

INSTAR	EARLY			LATE		
	Individuals	Average Length	Average Width	Individuals	Average Length	Average Width
	Number	*Mm.*	*Mm.*	*Number*	*Mm.*	*Mm.*
First	62	0.42	0.11	43	0.52	0.15
Second	48	.58	.18	30	.69	.22
Third	46	.79	.25	23	.94	.30
Fourth	42	1.03	.32	35	1.25	.39
Fifth	42	1.49	.48	42	2.44	.74

Prepupa and pupa.—After spinning its cocoon, the larva gradually changes in form, taking on that of the pupa in 4 to 6 days, depending on the temperature. Measurements made on 26 prepupae showed the average length to be 2.17 mm. and the average width 0.70 mm. at the greatest extremity.

The new pupa is white, the body tissue having a fresh, glossy appearance, with the thinner portions of the body translucent. The compound eye and ocelli range from a light purple to almost black. The appendages are closely folded against the body. As development progresses the body darkens until the characteristic adult color is assumed.

The average length of the 33 females measured was found to be 2.15 mm., less the ovipositor, which extends beyond the body approximately 0.28 mm. and upward at an angle of about 45 degrees. The average width at the widest portion was 0.76 mm. The males, in general, are considerably smaller. The 7 measured had an average length of 1.61 mm. and an average width of 0.55 mm.

Cocoons.—The parasite larva spins up inside the case of the host in an individual whitish, silken cocoon, somewhat elliptical in shape and like tissue paper in structure. Measurements made on 47 cocoons gave an average length of 2.84 mm. and an average width of 0.97 mm. The thin walls, which are easily torn with a sharp instrument such as a dissecting needle, often permit the outline of the pupa to be seen inside. When several parasites are found on a host, the cocoons are stuck together in a cluster (fig. 3), with the dried and shriveled remains of the host often crowded to one end of its case.

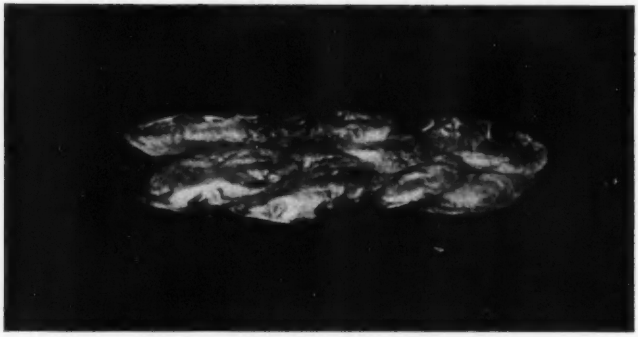

FIG. 3. Cocoons of *Chremylus rubiginosus* stuck together in a cluster. Approximately 8×.

The adult in emerging cuts through the thin wall of the cocoon with its mandibles at or near one end, and gradually works its way out head first, leaving the waste material and cast skin behind.

REARING METHOD

Chremylus rubiginosus has been reared with no difficulty on larvae of the casemaking clothes moth, *Tinea pellionella* that ranged in size from less than half grown to practically mature.

Cardboard pillboxes approximately 1⅝ inches in diameter were used for rearing cages. To permit ventilation, a hole approximately ⅝ inch in diameter was cut in both the top and the bottom of the box. Cheesecloth attached over the holes prevented the insects from escaping.

Clothes moth larvae, usually not more than 15 or 20, were placed in each pillbox, together with a small piece of raw wool or rabbit fur. From 5 to 15 female parasites were then introduced for the exposure. The hosts were normally exposed for about 24 hours, except where more detailed studies were being made on biology.

Examinations for the eggs were made by slitting the host case along one side and, by means of two insect pins, carefully opening it under a binocular. If the larva inside was found to be paralyzed, a thorough search was made for eggs, both on the body of the host and in the case. If eggs were present and the studies required only one parasite on a host, all eggs but one were removed. This was easily accomplished, as the eggs readily adhere to an insect pin. Any extra eggs were transferred to larvae that were paralyzed but on which no eggs had yet been deposited.

It was found advisable to keep the case of the parasitized larva closed between examinations. This was accomplished by means of a paper collar made by cutting a slit in a piece of tissue paper approximately 10 mm. square. The host case was inserted in the opening and drawn about half way through, a snug fit being essential. If the case was permitted to gap open, the parasite larvae, when nearly mature, would often work their way out into the pillbox, where they seldom developed normally. Where cases had been slit for examination, unparasitized host larvae would often mend them in a few hours.

In a few tests gelatin capsules (No. 3) were used to confine the host after parasitization. The larva was removed from its case and placed in the capsule. This permitted observations to be made at will, without disturbing either parasite or host. Two or three small holes punched in one end of each capsule with an insect pin permitted ventilation.

Although rearing was done on only a small scale, the writer believes that this parasite can be reared on a large scale with little or no difficulty.

LIFE-HISTORY STUDIES

Total development.—Studies were conducted to determine the effect of temperature and relative humidity on the total development of *Chremylus rubiginosus*. In most tests the host was exposed to the parasites for 24 hours in pillboxes of the type described above. The parasitized larvae were not always held for parasite development at the same temperature and relative humidity as those under which the exposures were made. Examinations for emergence were made at 24-hour intervals.

Total development was considered to be the period from the end of the host's exposure to the parasite to the emergence of the new parasites from the case of the host.

In test *A* the parasites were held for development in a constant-temperature cabinet operated at an average temperature of 81° F. and 61 per cent relative humidity. A total of 185 adults emerged, 51 males and 134 females. On an average 19.0 days were required for the males to develop, 18.4 days for the females, and 18.6 days for all individuals.

In test B the parasites were held in a constant-temperature cabinet operated at an average temperature of 81° F. and 43 per cent relative humidity. In this cabinet the relative humidity was 60 per cent for a few days before leveling off to 40 per cent, at which the cabinet was then operated. A total of 213 individuals emerged, 38 males and 175 females. On an average 22.0 days were required for the males, 20.9 days for the females, and 21.1 days for all.

In test *C* studies were conducted in a constant-temperature cabinet operated at an average temperature of 71° F. and an average relative humidity of 61 per cent. In this test 180 adults emerged, 86 males and 94 females. On an average, 29.1 days were required for the males, 28.9 days for the females, and 29.0 days for all.

In test *D* 235 parasites emerged, 41 males and 194 females. These data were collected during the winter, and the parasites were held for development in the basement of the laboratory. The fluctuation in temperature and relative humidity was not great. The average temperature for the period was 67° F. and the average relative humidity 38 per cent. On an average 31.7 days were required for the males to develop, 31.0 days for the females, and 31.1 days for all individuals.

Under conditions of test *E*, 194 parasites emerged, 92 males and 102 females. These parasites were held for development at room temperature during the winter, when the building was artificially heated. There was considerable variation in temperature and relative humidity. The relative humidity at times ran quite low. On an average 29.5 days were required for the males to develop, 28.9 days for the females, and 29.2 days for all.

In test *F* approximately 155 larvae of *Tinea pellionella* were exposed for parasitization, either at room temperature or in one of the abovementioned cabinets. After exposure they were held for parasite development in an electric refrigerator operated at an average temperature of approximately 53° F. The relative humidity was high, but the per cent is not known. No emergence occurred from the parasitized material while it was being held in the refrigerator. After approximately 105 days, part of the material was removed from the refrigerator and stored at room temperature. When examined a few days later, two female parasites were found, emergence having occurred after the material was removed. The remainder of the material was removed from the refrigerator after approximately 165 days and held in the basement of the laboratory. When examined a few days later, 4 males had emerged. No further emergence occurred from either lot. Since it is not uncommon for 4 or more parasites to emerge from one host, the emergence from the larvae held in the refrigerator was extremely low.

When the data were analyzed, the differences in the length of development between the two sexes was found to be highly significant in tests *A* and *B*, the males requiring the greater length of time. In tests *C*, *D*, and *E* the differences were not significant, but in all tests the trend was for a longer period of development with the males.

The differences in the length of time required for total development under the conditions described were found to be highly significant in all cases except in comparison between *C* and *E*. Comparisons were not made in test *F*, because of the small number of parasites that emerged. Total numbers were used for the comparisons.

In tests *A* and *B*, where the average temperature was the same but the average per cent relative humidity was different, the average time required for development was less at the higher relative humidity. In tests *A* and *C*, where the per cent relative humidity was the same but the temperature was different, development was considerably faster at the higher temperatures.

Development by stages.—Studies were conducted on length of the developmental period for the different stages of the parasite. Only one parasitized larva was held in each pillbox and only one parasite was permitted to develop on each host. Examinations were made three or four times daily at slightly lower temperatures than those at which the parasites were held for development. This may have resulted in lengthening the developmental period somewhat, although only a few minutes were required for each examination.

The incubation period was considered to be the interval from the time the egg was found until the hatch was observed; the larval period from the time of hatch until the larva was observed spun up; and the prepupal and pupal period from the time the larva spun its cocoon until the adult emerged.

In test *A* the parasites were held for development in a constant-temperature cabinet operated at an average temperature of 81° F. and 79 per cent relative humidity. The incubation period for 106 eggs averaged 1.4 days; the larval period for 37 individuals averaged 4.5 days; and the prepupal and pupal period for 24 individuals averaged 11.6 days. The period of time required for total development was the same for both males and females, being 17.4 days for the 33 adults that emerged.

When the time required for total development in this test is compared with that for *A* and *B* in the preceding test, the data again reveal that development was faster when the relative humidity was higher.

In test *B* studies were made to determine the time of development for the five larval stages. The parasites were held in a room where the temperature and relative humidity were not controlled. The temperature for the period averaged 74° F. and the relative humidity averaged 47 per cent. Examinations were made three times daily. To determine what effect frequent examinations would have on development, parasitized larvae were held under the conditions just described but the host cases were not slit open and the material was not disturbed by frequent examinations.

To find out when the parasite larvae molted, they were marked with a tiny speck of dry lampblack, which made it easy to determine when the larval skin was shed.

The incubation period for 93 eggs averaged 2.1 days. The average developmental period for the five larval stages was as follows: First, 0.9 day for 63 individuals; second, 0.6 day for 59 individuals; third, 0.5 day for 56 individuals; fourth, 0.7 day for 52 individuals, and fifth, 2.9 days for 45 individuals. The prepupal and pupal period required 16.2 days for 40 individuals. The total developmental period for the 47 adults (8 males and 39 females) averaged 23.7 days. The 39 females averaged 23.6 days and the 8 males 24.6 days.

From the check or undisturbed material, 58 males and 145 females emerged. The males required on an average 22.2 days for total development, and the females 22.6 days. For the total number of 203 adults 22.4 days were required. The data show that an average of 1 day less was required for development of the females in the check than in the material disturbed by frequent examination. This difference was found to be highly significant. Females were used for the comparison because of the small number of males that emerged in this test.

OVIPOSITION

Parasitization normally takes place with the host larva in its case (fig. 4), however, an occasional parasitized larva has been found out of its case. It is believed that the larva is generally paralyzed prior to oviposition as numerous larvae have been found paralyzed in their cases without eggs being present, although in one instance a larva was observed out of its case, crawling about with one egg attached to its body. With the exception of being inactive or practically so, paralyzed larvae appear quite normal for several days before they start to turn dark in color. In a few instances eggs have been found only partially inserted through the wall of the case, but normally they are deposited either on the external surface of the body of the host or on the inside of the case. Eggs have been found scattered all over the body of the host larva, either singly or in clusters of two or more.

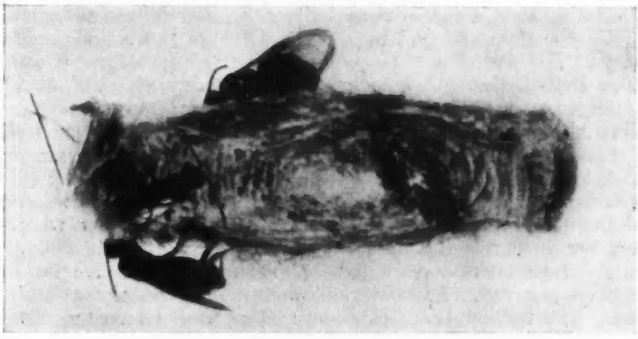

FIG. 4. Adults of *Chremylus rubiginosus* on a case of *Tinea pellionella* attempting oviposition. Approximately 9×.

Studies were conducted to determine the number of eggs individual female parasites would lay. The females were taken within a few hours after emergence and were placed in pillboxes in a constant-temperature cabinet. One female was placed in each box with a case-making clothes moth larva that was half grown or larger. Some of the females were paired with males. A raisin stuck on a pin in each box served as a source of food for the parasites. The host larvae were exposed to the parasites for 24 hours before they were examined for eggs. The host case was slit open along one side, as previously described, so that the case could be opened and the larva removed for examination under a binocular. Any eggs found in the case or on the host were counted and the number was recorded. After the examination the larva was returned to its case, if it had been removed, and the case was closed and held shut by means of the tissue-paper collar. If eggs were found a new larva was exposed, but if no eggs were present the larva was re-exposed. If found to be only paralyzed, it was again exposed, but was replaced with another larva at the end of 24 hours, regardless of whether oviposition had taken place.

In test *A* oviposition records were taken on 50 females that were held in a constant-temperature cabinet operated at an average temperature of 71° F. and an average relative humidity of 55 per cent. Any female that had at any time been exposed to a male was considered mated. Twenty-five of the females were mated, 23 were unmated, and the status of 2 was unknown. The maximum number of eggs laid by any mated female during her life was 27 and by any unmated female was 33, with a minimum of 0 in both cases. The average number of eggs for the 50 females was 15.8. The maximum number of eggs laid by any female in one day was 9 for the mated, and 7 for the unmated, with an average for all individuals of 1.5 eggs per day. The length of life for the mated females ranged from 7 to 14 days and for the unmated females from 4 to 20 days, with an average of 10.3 days for all individuals.

In test *B* data were obtained on 48 females, 29 mated and 19 unmated, that were held in a constant-temperature cabinet operated at an average temperature of 89° F. and an average relative humidity of 41 per cent. The maximum number of eggs laid during the life of any female was 30 for the mated and 21 for the unmated, with an average for all females of 11.2. The minimum number of eggs laid in both cases was 0. The maximum number of eggs oviposited by any female in 1 day was 10 for the mated and 9 for the unmated, with an average of 1.7 eggs per day for the 48 females. The mated females lived from 1 to 10 days and the unmated from 4 to 10 days, with an average of 6.6 days for all the females.

The average number of eggs laid per female during her life period was slightly higher with the mated females in tests both *A* and *B*, although the differences were not great enough to be significant. There was no significant difference in the average length of life between the mated and unmated in either test. The average length of life was longer and the average number of eggs laid per individual was greater with the females held under the conditions of *A*, the differences being highly significant.

LONGEVITY OF ADULTS

Studies were conducted to show the effect of different conditions of temperature and relative humidity on the length of life of adult parasites. The parasites were taken within 24 hours after emergence and were placed in ventilated pillboxes, with a raisin stuck on a pin for food. Examinations were made at 24-hour intervals and the results recorded. Females used for these studies were not used for oviposition purposes.

In test *A* the results were recorded on 81 adults, 31 males and 50 females, that were held in a constant-temperature cabinet at an average temperature of 81° F. and 61 per cent average relative humidity. The average length of life for the males was 8.0 days, for the females 11.4 days, and for all individuals 10.1 days. The maximum length of life of any male was 16.0 days and of any female 22.0 days.

In test *B* the data were taken on 190 adults, 82 males and 108 females, held in a constant-temperature cabinet at an average temperature of 72° F. and an average relative humidity of 59 per cent. The average length of life for the males was 9.7 days, for the females 13.8

days, and for all individuals 12.1 days. The maximum length of life for any one male was 26.0 days and of any female 34.0 days.

In test *C*, data are shown on 106 parasites, 12 males and 94 females, held in an electric refrigerator at an average temperature of 50° F. The average relative humidity was estimated at 60 per cent or higher. The average length of life for the males was 13.9 days, for the females 71.7 days, and for all individuals 65.2 days. The maximum length of life for any one male was 22.0 days and for any one female 137.0 days.

Under all three sets of conditions the average length of life for the females was longer than for the males, the differences being highly significant. As will be noted, the parasites lived longer at the lower temperatures.

MATING

Chremylus rubiginosus mated readily in confinement. On one occasion the case of a parasitized larva of *Tinea pellionella* was opened for examination. Seven females and one male parasite emerged. They were placed in a pillbox together, where they mated immediately.

On another occasion when two males were placed in a vial with five females, all of which had emerged a few hours previously, mating soon followed. The females gathered about the males with their ovipositors elevated at an angle of about 35 degrees. The males went from one female to another copulating.

SEX RATIO

From a sample of 979 adults, which were the progeny of females that had been confined with males, 79 per cent were females and 21 per cent were males.

PARTHENOGENESIS

The eggs from unmated females of *Chremylus rubiginosus* were viable, but in all observed cases only male progeny were produced.

SUPERPARASITISM

Superparasitism does occur with this parasite (fig. 5). As many as 30 eggs of *Chremylus rubiginosus* have been found on one larva of the casemaking clothes moth, and 21 large parasite larvae have been found on one host. It was not uncommon for 6 or 7 adult parasites to emerge from the case of a single host.

REARING OF TINEA PELLIONELLA

For several years abundant host material was successfully maintained with very little labor. Cultures were easily started by introducing adults of *Tinea pellionella* into cylindrical cardboard Rolled Oats boxes containing raw rabbit fur. When environmental conditions were favorable, the moths oviposited freely and the larvae made a vigorous growth. The same cultures were maintained by the writer for approximately 2 years by adding food as needed. If the cultures are permitted to run too long, considerable waste material accumulates in the bottom of the container, unless such material is removed from time to time.

During the winter months the cultures were held in a laboratory room where the temperatures ranged from 70° to 80° F. and the relative humidity from 40 to 45 per cent. During the summer months the cultures were held in the basement, where the temperature was seldom higher than 75° and where there was sufficient ventilation to prevent mold from forming.

As rearing media, pheasant feathers and raw sheep's wool were used with success, but the writer obtained the best results with raw rabbit fur as a medium.

FIG. 5. Nearly full-grown larvae of *Chremylus rubiginosus* in opened case of *Tinea pellionella*. Approximately 8×.

SUMMARY

Chremylus rubiginosus (Nees.) is a small braconid parasite of the larva of the casemaking clothes moth, *Tinea pellionella* (L.). It was taken from moth larvae collected from a wool warehouse in Columbus, Ohio, in 1931. Several hosts are recorded for this parasite, but all records are apparently European.

The eggs of *Chremylus rubiginosus* measure approximately 0.45 mm. long by 0.11 mm. wide through the thickest portion. The larvae pass through five instars, ranging in size from approximately 0.42 mm. by 0.11 mm. as an early first instar, to 2.44 mm. by 0.74 mm. as a late fifth instar. Before transforming to a pupa, the larva spins up in an individual silken cocoon inside the case of the host. The pupa of the female measures approximately 2.15 mm. long, less the ovipositor, by 0.76 mm. wide through the widest portion. The male pupa is considerably smaller.

In a laboratory room where the average temperature was 74° F. and the relative humidity 47 per cent, 2.1 days were required for incubation of the eggs, 0.9 day for the first larval stage, 0.6 day for the second, 0.5 day for the third, 0.7 day for the fourth, 2.9 days for the fifth, and 16.2 days for the prepupal and pupal periods. Total development for the 39 females and 8 males required 23.6 and 24.6 days, respectively.

Data on total development as influenced by other conditions of temperature and relative humidity are listed in the text. At the same temperature, the time required for development decreased as the relative humidity increased. At the same relative humidity development was faster at higher temperatures. The males usually developed more slowly than the females.

Oviposition records on 50 females held at an average temperature of 71° F. and 55 per cent relative humidity showed that an average of 15.8 eggs were laid by each female during her life. At 89° and 41 per cent relative humidity, data on 48 females show that 11.2 eggs were laid by each female.

Under the conditions of the tests, the average length of life of the females was greater than that of the males. In a constant-temperature cabinet, where the temperature averaged 81° F. and the relative humidity 61 per cent, the average length of life of 31 males was 8.0 days and of 50 females 11.4 days. At 72° and 59 per cent relative humidity, 82 males lived 9.7 days and 108 females 13.8 days. At 50° 12 males lived 13.9 days and 94 females 71.7 days.

Records on a sample of 979 adults showed that 79 per cent were females and 21 per cent were males.

Eggs from unfertilized females produced only male progeny.

Superparasitism occurs with *C. rubiginosus*. As many as 30 eggs were found on a single host, and 21 large parasite larvae were found in a single host case.

Cultures of the casemaking clothes moth have been reared on raw rabbit fur and pheasant feathers.

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These three articles continue Hayward's long series of reports on the skipper fauna of the Argentine. They include chiefly new records for the area and corrections of previous records. No new species are described but descriptions of the allotype female of *Astraptes fulgor* Hayward and the allotype male of *Lerodea gisparoides* Hayward and figures of the male genitalia of *Pellicia extensa* Mab. and *Erynnis austerus* Schaus are included. The notes on synonymy are important.—A. W. L.

CONTRIBUTION OF THE UNITED STATES NAVAL MEDICAL SCHOOL TO ZOOLOGICAL SCIENCE IN WORLD WAR II

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The chief mission of the United States Naval Medical School in peacetime has been the training of men of the Navy "for service ashore and afloat with special emphasis upon certain phases and branches of medicine and surgery of particular importance and peculiar to the Navy."[1] During the war just past, the primary function of the Naval Medical School was the training of personnel "in various specialties of timely importance incident to the war and to its geographical theaters of operation."[2] High on the list of these specialties were malariology, epidemiology, and tropical medicine.

Most of the men who made up the Navy malaria control units and epidemiology teams that were sent into the Atlantic and Pacific areas during the recent war attended the United States Naval Medical School, Bethesda, Maryland. A great number of them had been procured from ranks of civilian entomologists, parasitologists, and bacteriologists; from the Bureau of Entomology and Plant Quarantine, from the Fish and Wildlife Service, and from numerous colleges and universities. A considerable number of physicians gave up their private practices of medicine to head up these preventive medicine teams. They functioned in every continent and many of them participated in the insular invasions. Of the total of 801 officers and 1,711 enlisted personnel, belonging either to the Medical Corps or to the Hospital Corps of the Navy, who received training in Tropical Medicine at the Naval Medical School during the years 1942 to 1946, 223 officers and 656 enlisted men completed courses in parasitology and medical entomology leading to certificates in malariology, and 186 officers and 382 enlisted men attended the organized course in epidemiology.

In World War II, with the wide dispersal of these specialists trained in the field of biology and kindred sciences among the men of the United States Navy in the farflung corners of the earth, an unusual opportunity presented itself for the collection of valuable data and material for use in scientific study and research in the less turbulent days to follow. The malariologists and epidemiologists were trained primarily to join combat units or to take over malaria control at advanced bases. Some engaged in hazardous surveys prior to invasion, while others going in with the first and second waves were instrumental in making beachheads tenable. Frequently, many were called upon to initiate plague studies (Hawaii and South Pacific), to institute control measures for the vectors of typhus (Mediterranean area), to reduce the incidence of dengue

[1]Pugh, H. L., Rear Admiral (MC) USN, U. S. Naval Medical Bulletin 46(8) :1160, August, 1946.

[2]Ibid.

(Central Pacific islands), to recommend control of filariasis (Pacific area), and to carry on rigorous campaigns against mite-borne typhus (New Guinea and the Philippines). Part of their training was to make surveys, both of the diseases and of the vectors. If time permitted, they were urged to make more detailed studies of local problems and to complete surveys of the insect, mammalian, or other faunae. These sources of information made possible the development of more efficient and scientific control programs of the diseases and vectors involved, not only from the entomological angle but from a broad zoological aspect, and yielded an abundance of valuable material, including species new to science and specimens rare to museum collections. Material was obtained from many areas in the Pacific where collections had never before been made, especially in the Japanese Mandated Islands.

Early in the war, the Naval Medical School recognized the importance of maintaining a representative collection of insects of medical importance, and continuous efforts were made to add to this from all available sources. On August 3, 1943, the Bureau of Medicine and Surgery issued a letter to "All Ships and Stations," requesting that entomologists and malariologists collect and send to the Naval Medical School, Bethesda, Maryland, mosquito larvae and adults, in accordance with instructions provided. The cooperation of the United States National Museum was procured for identifying the specimens, both institutions appreciating the opportunity of building up a complete worldwide collection for reference and identification of unknown material, as well as an adequate collection for teaching Medical Entomology.

From December 1941 to January 1946, 157 separate lots of specimens (mainly insects) were received for examination and incorporation in the Medical School teaching and reference collections or for transfer to and identification by the various specialists of the Bureau of Entomology and Plant Quarantine and of the U. S. National Museum. These collections[3] included a total of 29,199 itemized specimens of insects (mainly mosquitoes, both larvae and adults) plus 931 miscellaneous specimens (molluscs, fishes, reptiles, birds, mammals, etc.), making a grand total of 30,130 individual specimens determined, for which identifications were returned through the Commanding Officer of the Naval Medical School to the senders in the field.

Since mosquitoes are the vectors of several important tropical diseases, particular emphasis was placed on their collection—the anophelines because of the association of certain species with the transmission of malaria and filariasis, and the culicines because among them are found the vectors of yellow fever, dengue, filiariasis, tularemia, and certain types of encephalitis.

In the genus *Anopheles*, 49 species were represented in the shipments received from 20 different localities. These included 1,036 adults and 1,126 larvae, specifically identified, and contained long series of some of the more important malarial vectors, such as ***annulipes***, ***farauti***, and ***punctulatus*** from Australia, New Guinea, and the Solomon Islands; ***albitarsis*** and ***darlingi*** from South America; ***albimanus***,***aquasalis***,

[3]Shipments from Navy Medical Research Units are not included in these collections.

bellator, and ***pseudopunctipennis*** from Central America and the Caribbean area; ***quadrimaculatus***, the common vector in the eastern United States; ***labranchiae labranchiae*** and ***sergenti*** from North Africa; ***minimus flavirostris*** from the Philippine Islands; ***hyrcanus sinensis*** from Japan; and ***stephensi*** from India.

Particularly representative collections of the anophelines of the respective areas were sent in from Brazil, Honduras, Nagasaki, New Guinea, New Hebrides, the Philippine Islands, and the Solomon Islands. Notes on the typical breeding and resting places of many of the species accompanied the specimens, adding materially to the information on the biology of some of the more important malaria vectors.

In the shipments of 1,693 adults and 1,100 larvae of the genus *Aedes* received at the Naval Medical School, 60 known species were included together with 11 new to science. Collections were made in 30 different localities, some of which provided new records of occurrence and distribution.

Aedes is the largest single genus of mosquitoes, containing over 500 different species. However, from the medical standpoint, it is of primary significance because it includes several species capable of transmitting important tropical diseases. The best known and most widely distributed species is the highly domestic ***aegypti***, the important cosmopolitan vector of urban yellow fever of dengue. Specimens of this species were received from Borneo, Espiritu Santo, Guam, Samar, Marshall Islands, Nanumea, New Hebrides, Okinawa, Saipan, Samoa, Tinian, and southern United States. A single collection of *A. **aegypti*** was obtained from New Guinea (Samarai) where it was believed to have been recently imported.

The oriental species ***Aedes albopictus***, known to transmit dengue in the Philippines and elsewhere in the oriental region, was received from Borneo, Hawaii, Nagasaki, Okinawa, Saipan, Tinian, and various localities in the Philippines.

Another important dengue vector represented in several shipments was ***Aedes scutellaris*** from New Guinea and New Hebrides. Other members of this scutellaris group were ***pernotatus*** from New Hebrides, Espiritu Santo, and Efate; and ***quasiscutellaris*** from Guadalcanal, Bougainville, and Treasury Island.

A number of specimens of ***Aedes pseudoscutellaris*** (diurnal biter), the principal vector of filariasis in the Samoa-Fijian area, were received from Samoa, Espiritu Santo, Nanumea and Lakena Islands. With the mosquitoes sent in from the filarial survey[4] of Samoa early in 1944, were ten slides of beautifully stained microfilariae of ***Wuchereria bancrofti*** and fifteen slides of microfilariae obtained by mosquito dissection, demonstrating the developmental stages from one to fourteen days. These were an unusual and valuable addition to the teaching material of the Naval Medical School. Two slides of microfilariae (*W. **bancrofti***) were also received with a collection of mosquitoes from the Malaria and Epidemic Control Unit at Iheya Island (Okinawa Group), June 1945.

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[4]Byrd, Elon E., Lt. H(S)USNR, St. Amant, Lyle S., Lt. (j.g.) H(S)USNR, and Bromberg, Leon, Commander, (MC)USNR, U. S. Naval Medical Bulletin 44(1):1–20. 1945.

Valuable teaching slides of the microfilariae of *W. bancrofti* and *W. malayi* were sent in from the Malaria and Epidemic Control Headquarters of the South Pacific Command at Espiritu Santo.

The new species of *Aedes*, described either by specialists in the National Museum or by Navy personnel working in cooperation with these specialists, from material sent in through the Naval Medical School were: *Aedes daggyi* Stone and Bohart, collected at Espiritu Santo, New Hebrides, by R. H. Daggy; *A. dorseyi* Knight, collected on Peleliu Island by C. K. Dorsey; *A. hensilli* Farner, collected on Ulithi Islands by George S. Hensill; *A. knighti* Stone and Bohart, collected on the Solomon Islands by W. G. Downs;*A. marshallensis* Stone and Bohart, collected on the Marshall Islands by D. A. Treat; *A. paradissimilis* Rozeboom, collected on the Philippine Islands, by J. H. Pallus; *A. paullusi* Stone and Farner, collected on Samar, Philippine Islands, by J. H. Pallus; *A. pernotatus* Farner and Bohart, collected on Espiritu Santo, New Hebrides, by K. L. Knight; *A. quasiscutellaris* Farner and Bohart (in addition to type material) from Guadalcanal, collected by A. B. Weathersby and others, and from Treasury Island, collected by J. H. Pallus; *A. saipanensis* Stone, collected on Saipan, Marianas Islands by Joseph Greenburg; and a specimen (*Stegomyia*) still undescribed.

By far the greatest number of individual specimens of mosquitoes received for identification belonged to the genus *Culex*, 4,471 adults and 3,725 larvae being transmitted to the National Museum for determination. These represented 56 separate shipments from 33 different localities, from which 72 species were identified.

The important species of the genus *Culex* from the point of view of disease transmission is the common house mosquito, *C. quinquefasciatus* (syn. *fatigans*) which is one of the known effective vectors of filariasis in certain areas. It is also a great pest in the warm temperate, tropical, and subtropical regions of the world. Both larvae and adults of this species were received from the following localities: Brazil, Espiritu Santo, Borneo, Guam, Hawaii, Honduras, Los Negros, Marcus Island, Marshall Islands, Nagasaki, Okinawa, Peleliu, Saipan, Samar, Samoa, Schouten Islands, Tinian, United States (California and Louisiana). Representative collections of other species of the genus *Culex* were received from these and other localities. New distribution records were thereby procured and specimens not hitherto represented in the Museum collection were obtained.

Numerous other new species of *Aedes*, *Anopheles*, and *Culex*, collected and described by members of NAMRU 2, are not included here.

Besides the three genera of medical importance, 1,555 adults and 952 larvae of miscellaneous culicids, representing 22 genera and 90 species, were submitted for identification. These were received in 35 separate shipments from 22 different localities. Some excellent collections added materially to the representative specimens in the National Museum from certain areas, and several species proved new to the collection: *Bironella hollandi* from Guadalcanal; *Megharinus nigripes* (male with larval and pupal exuviae, probably the first reared specimen of this species) from Tarakan, Borneo; and *Uranotaenia moultoni* also from Tarakan, Borneo.

Approximately 188 species and 86 genera were represented in the 3,080 specimens of Diptera (other than mosquitoes) sent in for identification. These were included in 27 separate shipments from 16 different localities, where in some instances extensive insect surveys had been made. Large and extensive collections were received from the Malariology and Epidemiology Control Units in Brazil, Espiritu Santo, Mariannas, Peleliu, Saipan, Southern Rhodesia, and the Transvaal. Of particular interest in these shipments were: *Diachlorus anduzei* from Brazil, previously known from Venezuela only; *Chlorotabanus mexicanus*, apparently the first Brazilian record; probably a new species of *Sarcophaga* from the Marianas; a series of larvae, pupae, and adults of *Culicoides pelilioensis* from Peleliu; a species of *Carnus* (probably new) from Saipan; five specimens of a bat parasite, *Cyclopodia inclita* (family Nycteribiidae), a Samoan species not previously reported elsewhere, from the Solomon Islands; several species of *Glossina* from Southern Rhodesia and the Transvaal, including *morsitans*, an important vector, and *brevipalpis* and *swynnertoni*, implicated in the transmission of the trypanosomes that are the causal organisms of sleeping sickness in man and "nagana" in horses and other livestock.

In addition to the large collections of Diptera, thirteen other orders of insects were represented in shipments received at the Naval Medical School and included 5 species of Anoplura, 38 of Coleoptera, 2 of Collembola, 3 of Dermaptera, 21 of Hemiptera, 4 of Homoptera, 48 of Hymenoptera, 3 of Isoptera, 2 of Lepidoptera, 16 of Mallophaga, 4 of Odonata, 29 of Orthoptera, and 10 of Siphonaptera, totalling 592 specimens in all.

Of the fourteen shipments of mites from eleven different localities, 648 specimens were identified. They included 50 genera and 60 species, six of which proved to be new to science. *Trombicula* new species (in manuscript) was collected by Navy personnel in the Philippine Islands; three new species of *Eutrombicula* (not yet described) and two new species of *Neoschongastia* (= *Paraschongastia*), *N. riversi* and *N. americanus solomonis* described by G. W. Wharton and A. B. Hardcastle, were among the trombiculid larval mites sent from Bougainville Island. A large collection made on Saipan contained 20 different genera of groups "almost unstudied" and probably most of the material is as yet undescribed, according to specialists in the group.

Only a few ticks were received for identification from three different localities—a total of 31 specimens representing five genera: *Argas*, *Amblyomma*, *Boophilus*, and *Rhipicephalus* from Brazil; *Boophilus annulatus microplus* from Guam; and two nymphs and fifteen larvae of *Ixodes* sp. contained in the ear of a rat from Freemantle, Australia.

Shipments of spiders were received from Peleliu, Agrihan, Tinian, and Parry Island. Those that were identifiable were twenty-five specimens of *Latrodectus hasselti* from Tinian and one specimen of *L. geometricus* from Parry Island with the comment that the species was abundant around the camp area.

Two scorpions, both *Hormurus australasiense*, were included in shipments from the Marianas and the Solomons. Also in the shipment from the Marianas were a few specimens of millipedes and centipedes.

Because of the prevalence of rodents on the Pacific islands and adjacent continental areas and the danger to our armed forces from the

bubonic plague and other rodent-borne diseases affecting man, rodent control was a part of the duties assigned to some of the officers given training in malariology and epidemiology at the Naval Medical School. Through their efforts, a representative collection of rodents and their ectoparasites was secured from the principal islands where control work was done and forwarded through the Naval Medical School to the National Museum.

During the early stages of the invasion of Leyte, a shipment of rodents was made from that island. A collection of rodents made in Guam embraced specimens of every form known to occur there. Among the 275 specimens of mammals (mainly rodents) received from 17 different localities, 52 species were represented.

A Navy Historical Survey of the Solomon Islands included in its collections not only a number of rodents but other mammals, birds, reptiles, molluscs, and miscellaneous arthropods. These were transmitted through the Naval Medical School to the specialists in the groups and proved in many particulars very useful and valuable additions to Museum collections. The birds from the Solomons consisted of 28 specimens representing 19 different species, and the molluscs consisted of 11 specimens representing as many different species.

As the result of a survey made early in 1945 by an epidemiology unit in Samar, a collection of molluscs yielded five different genera, including specimens of *Schistosomophora* which are the intermediate hosts for the Asiatic fluke, *Schistosoma japonicum*, in the region, and "the first reported for the Island of Samar." The total number of molluscs (preserved specimens) sent in from ten separate localities were 190 and included 76 different species. A large number of living molluscs, in connection with the study of bilharzia disease[5] (schistosomiasis) in Egypt, were sent to the National Naval Research Institute from the Epidemiology Unit in the Middle and Far East—*Planorbis boissyi* and *Bulinus truncatus*, intermediate hosts of *Schistosoma mansonia* and *S. hematobium*, respectively, from Egypt; also *Physopsis africanus*, the intermediate host of *S. hematobium*, and *Lymnaea natalensis*, the potential intermediate host of *S. japonicum*, from Natal and Southern Rhodesia.

Five collections totaling 138 specimens of reptiles, representing 28 different genera, were included in shipments from Australia, Brazil, the Marianas, and the Solomons. A very interesting survey made in 1944 by a malaria and epidemic control unit in Saipan added materially to the Museum's collection which prior to that time "had no material from this region except two examples of Lesson's skink."

Also in this collection from Saipan were 148 specimens of the western mosquito fish, *Gambusia affinis affinis*, native to the United States and one of the most widely planted fishes in the world. These were reported by the natives to have been introduced from Guam. In many places about the Island they had been planted in fish ponds, cisterns, and wells to control mosquito breeding.

A collection of balanoglossids, also included in the Saipan shipment,

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[5]Amberson, Julius M., Commander (MC)USNR, U. S. Naval Medical Bulletin 46(7):977-1010. 1946.

were identified as *Ptychodera flava* and constituted a new locality record, since they had not been taken before within many hundreds of miles of Saipan.

From the foregoing summary of the material received from Navy personnel engaged primarily in malaria and epidemic control in the various theaters of operation during World War II, it would seem that a very valuable contribution has been made to zoological science.

As the United States Navy advanced into previously unoccupied areas and boundaries of geographical importance were extended, it naturally followed, for the safety and welfare of the military forces, that a better knowledge of the zoogeographical regions of the world was necessary. The rare opportunity afforded for making collections in hitherto unexplored areas, in itself, was an incentive to add materially to the scope of present knowledge on the systematics and zoogeography of various groups and to provide a stimulus for future research. But of far greater importance, the material and data thus collected were of immediate practical value in relation to the possible transmission of diseases endemic to the regions by increasing the efficiency of the occupying forces to control the vectors and reservoirs of such diseases and to establish and maintain more healthful conditions, not only for the military personnel but for the native populations as well. Thus, the mission of the Medical Department of the United States Navy was fulfilled, an objective of the Naval Medical School was attained, and a service to humanity of far-reaching consequences was rendered.

THE MOSQUITOES OF ILLINOIS, by HERBERT H. ROSS. Bulletin of the Illinois Natural History Survey, Volume 24, Article 1, 96 pages, 184 figures, 1947.

This recent publication shares the excellent format and high quality of all of the Illinois Natural History Survey publications. It should be an excellent guide to the study of the mosquitoes of the midwestern region even beyond the limits of the state.

The introductory pages include an excellent brief survey of the bionomics of the group, methods of collecting and preserving material, study and rearing. The taxonomic portion begins with a brief statement on the characteristics of the family and its major subdivisions, with a key for the separation of the Chaoborin and Culicinae in both the larval and adult stages. The remaining portion covers the subfamily Culicinae in detail. Keys to genera are based on larvae, adults and genitalia of both sexes. Under each genus the species are keyed by larval characteristics and those of the adults of both sexes, and descriptions of the immature and adult stages are given. The records of distribution for the state of Illinois are detailed. Most of the figures are of genitalia and larval structures. All are excellent.

The bulletin concludes with a bibliography of thirty-two titles and an index of scientific names.—A. W. L.

A METHOD OF FILING BUTTERFLIES FOR THE STUDY OF GEOGRAPHICAL VARIATION

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The study of geographical variation requires large samples of individuals from populations of diverse geographical localities. For the study of butterflies, the old methods of pinning and spreading specimens

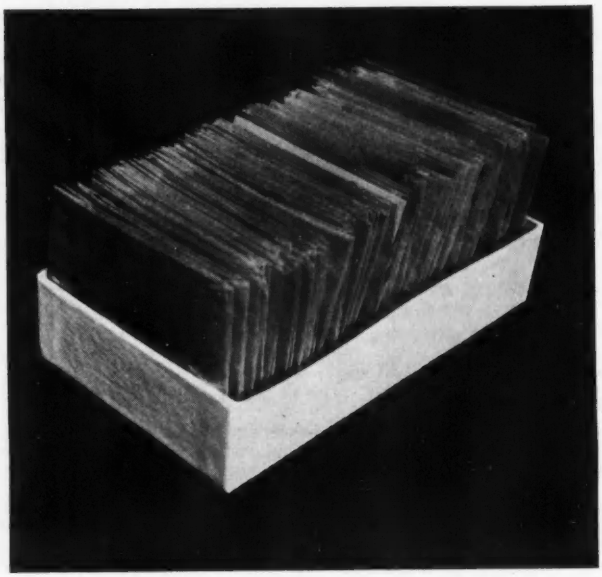

FIG. 1. A tray of specimens.

made a study of this sort almost prohibitive because of the high cost involved in the pinning, spreading and housing the material. All that is really required for the preservation of butterflies is that the specimens be dried and then protected from damage which may be inflicted by careless handling or by destructive insects.

For this purpose, a glassine paper bag has been found very convenient for the preservation, protection and filing purposes. By the use of the inexpensive glassine bag, many thousands of butterflies can be maintained for study in a space not greater than that occupied by only a few "legitimately" mounted specimens.

Glassine bags have been used for some years by collectors for the storage of unmounted material such as duplicates for which room could not be found in the cabinet. Other collectors have discouraged their use because by rough handling antennae, legs, etc., might become broken. I have found, however, that with reasonable care equivalent to that given to triangularly papered specimens or to mounted specimens, the butterflies remain in excellent condition. Specimens have been kept for over twelve years and are still in excellent condition.

The glassine bag is superior to ordinary soft paper because the contact between the paper and the butterfly wing is such that the scales on

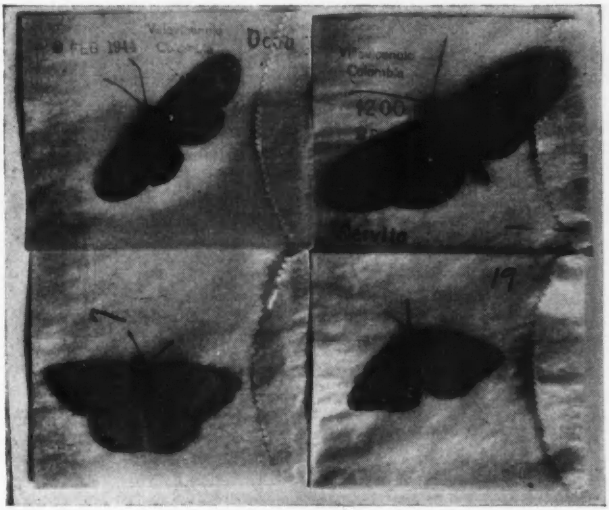

FIG. 2. Butterflies in glassine bags.

the wing may adhere to the soft paper. Because of the smooth surface of the glassine bag, the scales are not removed and it is possible to open the wings in a spread condition instead of allowing them to remain closed across the thorax. With the opened specimens protected on both sides by the semi-transparent paper, the butterflies can be observed without direct handling. Should closer scrutiny be required, the specimens can be removed from the bag easily with a pair of wide-tipped forceps.

Cellophane is superior to glassine paper for its smoothness and transparent nature but it does not permit of the drying of the specimen. For this reason, cellophane bags are not recommended. In the glassine bags, the specimens dry naturally.

It is desirable to fold over and crease the top of the glassine bag. This operation aids in retaining the specimen within and any museum

pest without. Also, the flap made by thus folding over the top creates a bumper which protects the specimens against crushing when packed.

The glassine bags can be filed on edge according to locality and species in fiberboard boxes or trays of small size. Recommended sizes for small or medium sized butterflies are the following:

bag, 2½ x 3½ inches.
box, 2½ x 3½ x 6 inches.
tray, 2½ x 3½ x 1 inch.

The glassine bag is also excellent for the transport of living female butterflies when it is desired to transport any to the laboratory for egg laying. The females are merely placed in the bag preferably with the wings folded over the thorax and they are then rendered relatively immobile. If they are not overheated or severely dessicated, the females will live for several days. Most species of the temperate regions will remain alive and immobile for many days or weeks in a refrigerator. Maintaining them in a moist chamber will aid in keeping them alive.

The illustrations show the method of placing the butterflies in the glassine bags and filing them in the trays. Complete data may be written on each bag or numbers may be written on the bags temporarily for rapid marking during the course of a trip.

PLANT HORMONES (AUXINS) AS A FACTOR IN THE HATCHING OF AEDES TRIVITTATUS (COQUILLETT) EGGS[1]

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Aedes trivittatus (Coquillett) breeds in temporary pool situations. It passes the winter in the egg stage and the larvae often may be found during summer in the temporary pools formed by rains. It is observed that there is plenty of plant growth in these pools and the most common plants are Blue-grass (*Poa sylvestris* Gr.) and nodding Fescue-grass (*Festuca nutans* Willd.). As first instar larvae are usually observed in these pools immediately after a rain, it was thought that these grasses have something to do with the eggs hatching.

Connell (1941) working on the hatching response of *Aedes sollicitans* eggs demonstrated that when the eggs were flooded for one hour every 24 hours in infusions of plants (*Spartina alterniflora*, *S. patens*, and *Distichlis spicata*) characteristic of highly saline marshes, 82, 76, and 48 per cent, respectively, of the eggs hatched. Infusions of plants (*Scirpus olneyi*, *Panicum virgatum*, and *Spartina cynosuriodes*) from marshes of lower salinity stimulated the hatching of 73, 63 and 24 per cent respectively of the eggs, while with *Zizania palustris* from fresh water tide marshes and *Cyperus ferax*, which grows in wet meadows in the interior, 64 and 35 per cent respectively of the eggs hatched. In the infusions of *Juncus effusus* and *Typha angustifolia* the hatching stimulant was present only in small quantities, if at all, since only 12 and 7 per cent respectively hatched. Connell attributed the hatching of the eggs to a stimulant present in the infusions. Gjullin, Yates and Stage (1939) found that tap water infusions of dry cottonwood leaves, willow leaves, and grass gave consistently larger hatches of *Aedes vexans* (Meig.) and *Aedes lateralis* (Meig.) (*A. aldrichii* Dyar and Knab) eggs than either tap or river water alone. They concluded that the amino acids and proteins present in the vegetation may be the stimulants which cause the eggs to hatch when flood in nature. The same authors (1939) mentioned also that a number of organic chemicals and inorganic chemical elements necessary for plant and animal growth were tested individually and in combination but they did not cause hatching, so they eliminated in their considerations, the possibility of the effect of growth substances on the hatching. It is the object of this paper to introduce the effect of organic growth substances on the hatching of *Aedes trivittatus* eggs.

METHOD OF SECURING EGGS OF AEDES TRIVITTATUS FOR EXPERIMENTS

The eggs used in this work were deposited on damp cotton in the

[1]Contribution from the Department of Zoology and Entomology.
I wish to express my gratitude to Dr. Carl Venard, Associate Professor of Zoology and Entomology, The Ohio State University, for his helpful suggestions and supervision. Appreciation is expressed to the Botany Department, The Ohio State University, for supplying the growth chemical substances. I also wish to thank Mr. Donald Hoffman, Chemistry Department, The Ohio State University, for help in the preparation of the infusion concentrates.

bottom of glass shell vials, 65 x 22 mms. by wild adult females collected from their breeding areas by means of an aspirator after each had engorged with blood from the arms of the author. Near the end of feeding, which takes an average of one minute, they were collected by means of the aspirator and put in a pint Mason jar, the mouth of which was fitted with two overlapping pieces of thin rubber each of which having a long slit in its middle, and were so imposed that the two slits lie perpendicular to each other so as to form a (+) figure. In this way when the glass tube of the aspirator was inserted through the opening between the slits and then removed, the opening closed immediately by the elasticity of the rubber. In the laboratory the blood-engorged adult mosquitoes were isolated each in a vial having a damp cotton layer in its bottom. The opening of the vial was closed by means of a piece of muslin held in place by a small rubber band. Under laboratory conditions with a temperature fluctuating between 80° and 85° F. it took an average of three days for the blood-fed females to oviposit their quota of eggs. Not a single female of *Aedes trivittatus* survived after oviposition. The eggs were kept on the damp cotton where they had been placed by the mosquito, until experimentation.

Eggs were rendered bacteriologically sterile by immersion for five minutes in a solution of five per cent formalin and one per cent sodium hydroxide, as used by Simmons (1932) for the sterilization of blowfly eggs; and the same method adopted by Gjullin, Hegarty and Bollen (1941) for the sterilization of Aedes mosquito eggs.

EFFECT OF PLANT INFUSIONS ON HATCHING OF TRIVITTATUS EGGS

Plant infusions were prepared by soaking chopped blue grass stems and leaves in distilled water in the proportion 20 mg. of grass to each ml. of water. After letting stay for 2 hours, with shaking every half hour, the infusion was filtered through fine meshed muslin. When ten ml. of the filtrate was added to ten eggs, from 50 to 70 per cent of the eggs hatched after 30 minutes. This effect might be due to the microorganisms found in the infusion. The experiment was repeated and this time a portion of the infusion filtrate was passed through a Berkfeld filter in order to eliminate the microorgânisms; another portion was autoclaved at 120° C. under 15 pounds pressure in order to see if such a treatment would affect the infusion's viability for hatching and still another portion was left without other treatment. The results are shown in Table I.[2]

[2]The percentage of eggs hatching given in the tables represent the averages of a certain number of experiments using a certain number of eggs per tube of medium in each experiment. The media were applied to the eggs in the proportion of 1 ml. of medium per egg.

Table No.	No. of Experiments Performed	No. of Eggs Used Per Tube of Medium in Each Experiment	Average Number of Eggs Used Per Tube
I	4	10	10
II	4	7	7
III	2	8 and 10	9
IV	3	5, 6 and 10	7
V	2	8 and 10	9

As both the micro-organism-free and the non-treated infusion in Table I gave hatchings; and although the latter gave quicker and higher per cent of hatching than the former infusion, there seemed obviously, other than the microorganismal factor inside the plant infusion which caused the hatching of *Aedes trivittatus* eggs. Also this factor is probably heat labile as it lost its hatching activity when subjected to a temperature of 120° C. under 15 pounds pressure.

TABLE I

PER CENT OF *Aedes trivittatus* EGGS HATCHING WHEN FLOODED WITH DIFFERENT TREATMENTS OF BLUE GRASS INFUSION

CONDITION OF THE INFUSION	PER CENT HATCHED AFTER					
	1 hr.	1 hr.	4 hrs.	24 hrs.	48 hrs.	72 hrs.
Non-treated Infusion	42.5	52.5	67.5	78	82.5	82.5
Micro-organism free Infusion	0	0	10	35	40	45
Autoclaved Infusion	0	0	0	0	0	0
Distilled H_2O	0	0	0	0	0	0

The experiments were repeated using concentrate of the infusion. This concentrate was prepared as follows: two grams of dried blue grass and 100 mls. of distilled water were mixed for five minutes on a Waring Blender after adding one-half gram of Celite (an inert white powder to promote filtration). The whole slurry was then filtered with suction.

TABLE II

PERCENTAGE OF *Aedes trivittatus* EGGS, HATCHING WHEN FLOODED WITH DIFFERENT TREATMENTS OF BLUE GRASS INFUSION CONCENTRATE IN DISTILLED WATER

CONDITION OF THE CONC. PLUS WATER	PER CENT HATCHED AFTER					
	½ hr.	1 hr.	4 hrs.	24 hrs.	48 hrs.	72 hrs.
Conc. plus water	18.0	28.5	46.5	64.5	68.0	75.0
Micro-organism-free conc. plus water	0	0	14	64	64	71.5
Autoclaved conc. plus water	0	0	0	0	0	0
Distilled Water	0	0	0	0	0	0

The filtrate was then concentrated under reduced pressure to about one ml. Now in order to get more or less the same infusion concentration as that of the last experiments, the concentrate was added to distilled water in the proportion of one-tenth ml. to ten mls., respectively. Then a portion of this solution was filtered through a Berkfeld filter, another portion was autoclaved and a third portion was tested without other treatment. The result of these experiments is shown in Table II.

These results show that concentration of the blue grass infusion did not destroy the active agent present inside it and responsible for the egg hatching, in fact, it looks like it has increased its activity as can be seen

from the higher per cent of hatch when the microorganisms were eliminated.

These experiments gave the author the idea of testing the effect of known organic plant growth substances, on the hatching of eggs.

EFFECT OF PLANT GROWTH HORMONES ON THE HATCHING OF AEDES TRIVITTATUS EGGS

From the many chemical substances known to promote growth in plants, three compounds were selected and experimented with; these are *α-naphthalene-acetic* acid, *indole acetic acid* and *δ-3-indole butyric* acid. The principal plant responses induced by these growth substances are: local initiation of roots on stems and leaves; local acceleration or retardation of growth, causing swelling and bending of stems; epinasty, hyponasty or twisting of leaves according to the place the compounds were applied and possibly local anaesthesia. According to Zimmerman and Wilcoxon (1935) α-naphthalene-acetic acid and indole butyric acid are the most effective root-forming substances yet discovered; they are not as effective as indole acetic acid for epinastic response of leaves.

TABLE III

PERCENTAGE OF *Aedes trivittatus* EGGS HATCHING WHEN FLOODED WITH DIFFERENT CONCENTRATIONS OF α-NAPHTHALENE ACETIC ACID IN DISTILLED WATER

CONC. OF α-NAPHTHALENE ACETIC ACID USED	PER CENT HATCHED AFTER					
	½ hr.	1 hr.	4 hrs.	24 hrs.	48 hrs.	72 hrs.
Zero–9 ppm	0	0	0	0	0	0
10 ppm	1	11	72	83	83	83
11–13 ppm	0	0	0	0	0	0
14 ppm	0	0	0	0	6	6
15–19 ppm	0	0	0	0	0	0
20 ppm	0	22	39	50	62	62
21–50 ppm	0	0	0	0	0	0

When 50 ppm solution of each of these three growth substances was prepared in distilled water and applied to eggs, no hatching took place with any of them. Dilutions starting from one ppm up were made from each of these concentrations (used as a mother liquor) and tried on *Aedes trivittatus* eggs, hatchings took place in a definite concentration range in each growth substance as can be seen in Tables III, IV and V.

It is apparent from Tables III to V that the three growth substances bring about the hatching of *Aedes trivittatus* eggs, within a certain concentration range in each.

It seems very likely that the inability of Gjullin, Yates and Stage (1939), to get hatching of *Aedes vexans* (Meig.) and *Aedes laterlais* (Meig.) eggs, from the organic chemicals necessary for plant and animal growth is that the concentrations they used must have not been in the concentration range of hatchability of these substances.

By comparing the minimum threshold values and concentration

range of these three compounds to cause bending of the stems of sweet pea and tomato, respectively, as given by Zimmerman and Wilcoxon (1935); with their threshold values and range causing hatching of

TABLE IV

PERCENTAGE OF *Aedes trivittatus* EGGS HATCHING WHEN FLOODED WITH DIFFERENT CONCENTRATIONS OF INDOLE-ACETIC ACID IN DISTILLED WATER

CONC. OF INDOLE ACETIC ACID USED	PER CENT HATCHED AFTER					
	½ hr.	1 hr.	4 hrs.	24 hrs.	48 hrs.	72 hrs.
Zero–3 ppm	0	0	0	0	0	0
4 ppm	0	0	0	5	5	5
5 ppm	0	0	0	67	81	95
6 ppm	0	0	0	0	0	0
7 ppm	0	0	0	5	10	10
8 ppm	0	0	0	5	5	10
9 ppm	0	0	0	0	0	0
10 ppm	0	0	0	29	38	57
11 ppm	0	0	0	0	0	0
12 ppm	0	0	0	0	0	0
13 ppm	0	0	0	5	10	14
14–50 ppm	0	0	0	0	0	0

TABLE V

PERCENTAGE OF *Aedes trivittatus* EGGS HATCHING WHEN FLOODED WITH DIFFERENT CONCENTRATIONS OF δ-3-INDOLE BUTYRIC ACID IN DISTILLED WATER

CONC. OF γ-3-INDOLE BUTYRIC ACID USED	PER CENT HATCHED AFTER					
	½ hr.	1 hr.	4 hrs.	24 hrs.	48 hrs.	72 hrs.
Zero ppm	0	0	0	0	0	0
1 ppm	0	0	0	0	0	0
2 ppm	0	0	0	6	6	6
3 ppm	0	0	6	39	67	72
4 ppm	6	6	6	22	39	39
5 ppm	0	0	0	44	83	83
6 ppm	0	0	0	0	0	0
7 ppm	0	0	0	11	17	22
8 ppm	0	0	0	6	6	6
9 ppm	0	0	0	0	17	28
10 ppm	6	6	6	17	44	56
11–13 ppm	0	0	0	0	0	0
14 ppm	0	0	0	6	6	11
15 ppm	6	6	6	11	17	17
16–50 ppm	0	0	0	0	0	0

Aedes trivittatus eggs as found by the author, we can see obviously that it takes infinitesimal amounts of these chemical substances to cause hatching of the eggs as compared with the tremendous amounts needed to cause response in the plants.

In working with these three growth substances it was noticed that the hatching activity was lost when their aqueous solutions stand for a week. So it is recommended that fresh solutions of these growth substances be prepared before investigating their effects.

It is worth noting that 2, 4-dichlorophenoxy acetic acid (2, 4-D) which was introduced by Zimmerman and Hitchcock (1942) together with other halogen substituted phenoxy compounds, as a plant growth substance, was tested in various concentrations ranging from one to 100 ppm. for its effect on the hatching of *Aedes trivittatus* eggs, but no hatching took place at any concentration in that range.

Further studies regarding the possibility of using these growth substances in the control of this mosquito are planned.

TABLE VI

MINIMUM THRESHOLD VALUES AND EFFECTIVE CONCENTRATION RANGE OF THE GROWTH SUBSTANCES FOR TOMATO, SWEET PEA, AND *Aedes trivittatus* EGGS, EXPRESSED IN PPM.

CHEMICAL SUBSTANCE	MIN. THRESHOLD VALUE CAUSING		CONC. RANGE CAUSING	
	Bending of sweet pea stem	Hatching of *A. trivittatus* eggs	Negative bending of tomato stem	Hatching of *Aedes trivittatus* eggs
α-naphthalene acetic acid.....	500 ppm	10 ppm	100–20,000 ppm	10–20 ppm
γ-3-indole butyric acid	250 ppm	2 ppm	100–20,000 ppm	2–15 ppm
indole acetic acid....	5 ppm	4 ppm	3–20,000 ppm	4–13 ppm

SUMMARY

Aedes trivittatus (Coquillett), which breeds in temporary pools, passes the winter in the egg stage. Blue grass infusions were found to affect hatching of the eggs, even after elimination of the microorganisms from the infusion by filtering through a Berkfeld filter. The water solutions of three plant growth substances viz.: *α-naphthaleneacetic* acid, *γ-3-indole butyric* acid and *indole acetic* acid, brought about egg hatching at a definite concentration range in each; these ranges are 10 to 20 ppm., 2 to 15 ppm. and 4 to 13 ppm., respectively. The ranges of these three growth substances are very low as compared to their ranges which cause bending of tomato stems as given by Zimmerman and Wilcoxon (1935).

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SEXUAL BEHAVIOR IN THE HUMAN MALE, by ALFRED C. KINSEY, WARDELL B. POMEROY and CLYDE E. MARTIN. xv+804 pages. W. B. Saunders Company, Philadelphia, 1918. Price $0.00.

When a book has climbed rapidly to a high place in the list of best sellers and has been reviewed extensively in the magazines and newspapers it seems almost superfluous to bring it to the attention of readers of the ANNALS at the necessarily late date permitted by our quarterly publication. The fact that Doctor Kinsey is an entomologist, however, makes his attainment in a different field of investigation particularly interesting to his fellow entomologists.

Since so much has been said of the book in print it is most significant to consider the nature of this reception. It has suffered some criticism for the limited number of cases considered, since it is based on studies of 5300 white males, and has also been subject to some doubt of the validity of the method of examination. On these counts the authors' comment that the number of cases so far recorded is approximately forty times as large as the amount of material on which the best previous studies were based seems to dispose effectively of the first and the incredible frankness of the disclosures seems adequate evidence of the effectiveness of the methods employed. The authors do not claim that their results are ideal nor perfect. Even though the reader may agree with them in feeling that more can be learned of the subject, if he is not hypercritical he must realize that the book is an extremely valuable addition to our knowledge of the subject.

The book is arranged in three parts: History and Method, Factors Affecting Sexual Outlet, and Sources of Sexual Outlet. It includes a detailed consideration of the incidence of all types of sex behavior, both normal and abnormal, and of their correlation with various aspects of human life such as economic and occupational status and marriage. Discussion is comparatively brief but the tabulation and graphic presentation of data are extensive. Many of the disclosures are surprising, notably the class distribution of masturbation and the differences in sexual relations in marriage in different classes of our population. The impression created by the book in the mind of the reviewer is that the authors have presented one of the first, if not the first, adequately frank and dispassionate analyses of their subject, and that the book should be a boon to parents who have young boys to raise as well as to biologists who are scientifically interested in sex relations.

It is a fairly safe assumption that the tremendous demand for the book is largely a result of curiosity about anything connected with sex. The reader who buys it to satisfy mere curiosity will probably be disappointed for he will find in it nothing that is pornographic and little that can have similar effects. It is simply a scientific presentation of materials which, from their very nature, must attract a considerable amount of undesirable attention.

In brief we may conclude that the comments of reviewers are the inevitable result of diverse points of view and of the apparent desire of many critics to find whatever weakness they can in anything that they consider. Certainly the book is a remarkable assemblage of data on a difficult subject which has been obscured too long by popular attitudes, and an able analysis and presentation of the authors' findings. The completion of their studies result in far better understanding of the problems of sex than has yet been available.—A. W. L.

LIBERATION OF ORIENTAL SCOLIOID WASPS IN THE UNITED STATES FROM 1920 TO 1946

(Hymenoptera: Scoliidae, Tiphiidae)

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During the period 1920–1933 numerous specimens of a dozen odd species of scolioid wasps were imported from the Orient and liberated in the northeastern United States for control of the introduced *Popillia japonica* Newm. [Japanese beetle], *Anomala orientalis* Waterh. [oriental beetle], *Autoserica castanea* (Arrow) [Asiatic garden beetle] and *Serica peregrina* Chapin. Subsequent to 1933 liberations were made of *Tiphia castaneaevora* Parker, *T. popilliavora* Rohwer, *T. sternata* Parker and *T. vernalis* Rohwer only.

Admirable summaries of the biological investigations on these wasps in their native countries were published by Clausen, King and Teranishi,[1] Clausen, Jaynes and Gardner,[2] and Gardner and Parker,[3] and summaries of the number of specimens shipped to the United States during the periods 1920–1928 and 1920–1933, respectively, are included in the last two papers. However, relatively few published records are available on the liberation in the United States and on the successful or unsuccessful establishment of any of the species except *T. popilliavora* and *T. vernalis*.

Recently in connection with my work on the scolioid section of a proposed cooperative Synoptic Catalog of the North American Hymenoptera, I had occasion to visit the Fruit Insect Investigations Laboratory of the Bureau of Entomology and Plant Quarantine at Moorestown, New Jersey. This visit was necessitated by the almost entire lack of published data on liberation and subsequent recovery of the parasites. Detailed card files are maintained at Moorestown showing the date, exact locality and number of specimens for each colony of parasites released in the field, and also recovery data on the various species for which subsequent scouting was done. I am indebted to C. H. Hadley, J. L. King and L. B. Parker for making these records available and for many other courtesies extended during my brief visit in Moorestown.

Inasmuch as only an extremely limited space will be available for distributional data in the proposed catalog, I will present here more detailed data on the various liberations. These data are summarized by counties under the various States in alphabetical order. The date in parentheses refers to the earliest year in which a liberation was made in that particular county—additional colonies of the successfully established species were liberated in many of the counties in subsequent years. Some brief remarks on recovery data are made following the distributional data of each species. As a result of the recovery data

[1] 1927. U. S. D. A. Bull., 1429.
[2] 1933. U. S. D. A. Tech Bull., 366.
[3] 1940. U. S. D. A. Tech. Bull., 738.

presented herein, the following species are to be regarded as established members of the North American fauna:

Tiphia asericae Allen & Jaynes
Tiphia popilliavora Rohwer
? *Tiphia sternata* Parker
Tiphia vernalis Rohwer

Family **Scoliidae**

Campsomeris annulata (Fabricius)

NEW JERSEY—Burlington (1925).

Over 4000 adult females and males were released in the summer and fall of 1925 and 1926 from material shipped from China and Japan. This species is normally parasitic on larger species of Scarabaeidae, particularly *Anomala* and *Phyllophaga*, but development on *Popillia japonica* was obtained in the laboratory. Apparently this species did not become established in this country, as no recoveries have been made.

Campsomeris marginella modesta (Smith)

NEW JERSEY—Burlington (1920).

More than 11,000 adult females and males were released on the grounds of the Riverton Country Club in the summers of 1920, 1922 and 1923 from material shipped from Hawaii. This species is a native of the Philippine Islands and was introduced into Hawaii as *Scolia manilae* Ashmead (=*marginella modesta*) a number of years ago for control of *Anomala orientalis*. Efforts to establish it in the United States for control of *Popillia japonica* were unsuccessful.

Family **Tiphiidae**

Tiphia asericae Allen & Jaynes

NEW JERSEY—Bergen (1931).
NEW YORK—Nassau (1928), Queens (1932).
PENNSYLVANIA—Montgomery (1931), Philadelphia (1930).

This species, a native of Japan, Korea and China, was liberated for the control of *Serica* and *Autoserica* in Nassau and Queens Counties, N. Y., and for the control of *Autoserica* in Bergen County, N. J., and Montgomery and Philadelphia Counties, Pa. Some of the individuals released in Nassau County, N. Y., and Montgomery and Philadelphia Counties, Pa., established themselves, for recoveries were made one or more years after the original liberations. Recoveries were made from one Philadelphia County colony as late as 1938. I have examined 4 ♀♀ and 11 ♂♂ recovered in the field from colonies one or more years old. These specimens were identified as *asericae* by L. B. Parker, and I am able to confirm his determination.

Tiphia bicarinata Cameron

CONNECTICUT—New Haven (1926).
NEW JERSEY—Burlington (1926).

Three females were released in Connecticut in the fall of 1926 and almost 1000 females and males in New Jersey in the fall of 1926 and

summer of 1927 from cocoons shipped from Korea for control of *Anomala orientalis*. Apparently the species failed to become established, for recoveries have never been made.

Tiphia biseculata Allen & Jaynes

NEW JERSEY—Camden (1926).
NEW YORK—Nassau (1929).

Over 1500 males and females of this Japanese species were released in New Jersey and New York in 1926 and 1929, respectively, for control of *Popillia japonica*. In the summer of 1933 about 4500 females and males were liberated in Nassau County, N. Y., for control of *Anomala orientalis*. Apparently none of these colonies became established.

Tiphia castaneaevora Parker

NEW JERSEY—Burlington (1935).
PENNSYLVANIA—Montgomery (1934), Philadelphia (1934).

About 400 females and males were liberated in New Jersey in 1935 and about 4700 females and males in Pennsylvania in 1934 and 1935 from Japanese material for control of *Autoserica castanea*. Apparently none of these colonies became established, for recoveries have never been made.

Tiphia frater Parker

NEW JERSEY—Burlington (1926).

About 10 females from cocoons from China were liberated, but apparently the species did not become established.

Tiphia matura Allen & Jaynes

NEW JERSEY—Burlington (1929).

About 300 females and 20 males from cocoons from India were liberated in October for control of *Popillia japonica*. Apparently this species did not become established.

Tiphia notopolita var. **alleni** Roberts

NEW YORK—Nassau (1933).

About 200 females and 60 males were liberated in 1933 from cocoons reared in Japan for control of *Anomala orientalis*. Apparently this species did not become established.

Tiphia popilliavora Rohwer

To date taxonomic studies have failed to reveal any morphological differences between the Japanese, Korean, and Chinese strains of this species. However, they do differ consistently in emergence dates both in their native countries and in the United States, the Korean strain being two weeks later than the Japanese and three weeks earlier than the Chinese. Releasement records for the Japanese and Korean strains (the only two in use in the United States) are maintained separately at the Japanese Beetle Laboratory, and I have summarized these data separately inasmuch as future taxonomic work may reveal reliable structural characters for their separation. The species is an effective parasite of *Popillia japonica*.

Tiphia popilliavora Rohwer (Japanese strain)

CONNECTICUT—Fairfield (1937), Hartford (1937), New Haven (1928), New London (1938), Windham (1938).
DELAWARE—New Castle (1934).
MARYLAND—Anne Arundel (1939), Caroline (1939), Cecil (1934), Dorchester (1938), Harford (1938), Kent (1938), Prince Georges (1939), Queen Annes (1939), Somerset (1938), Washington (1938), Wicomico (1939), Worcester (1938).
NEW JERSEY—Burlington (1921), Camden (1927), Gloucester (1927), Hunterdon (1935), Mercer (1928), Middlesex (1934), Monmouth (1935), Salem (1931), Somerset (1934).
NEW YORK—Nassau (1927), New York City (1939), Queens (1928), Westchester (1938).
OHIO—Cuyahoga (1943), Guernsey (1943).
PENNSYLVANIA—Bucks (1927), Chester (1930), Cumberland (1934), Dauphin (1929), Delaware (1928), Montgomery (1928), Philadelphia (1927).
VIRGINIA—Chesterfield (1939), Henrico (1944), Norfolk (1939), Northampton (1939), Westmoreland (1944).

Scouting work in 1945 established that colonies over two years old were flourishing in all states but Maryland (no scouting was done in Virginia or Ohio).

Tiphia popilliavora Rohwer (Korean strain)

CONNECTICUT—New Haven (1945).
DELAWARE—New Castle (1937).
MARYLAND—Cecil (1937), Harford (1942).
NEW JERSEY—Camden (1927), Hunterdon (1935), Mercer (1935), Middlesex (1936), Somerset (1936).
NORTH CAROLINA—Buncombe (1943) Henderson (1943).
OHIO—Mahoning (1942).
PENNSYLVANIA—Chester (1936), Delaware (1934), Montgomery (1935), Philadelphia (1935).
VIRGINIA—Chesterfield (1945), Henrico (1945).

Scouting work in 1945 established that colonies over two years old were present in New Jersey and Pennsylvania. None could be found in Delaware or Maryland, and scouting was not done in the other States.

Tiphia pullivora Allen & Jaynes

PENNSYLVANIA—Montgomery (1928).

About 1400 females and 3705 males were liberated in the summer and fall of 1928 from cocoons from India for control of *Popillia japonica*. Apparently this species failed to become established.

Tiphia sternata Parker

NEW JERSEY—Burlington (1935), Essex (1935), Union (1935).
NEW YORK—Nassau (1933), Queens (1933).
PENNSYLVANIA—Montgomery (1933), Philadelphia (1934).

Females of this species were liberated for control of *Serica* from field collected adults from Japan. One female was collected in 1937 in Burlington Co., N. J., where a colony had been liberated the previous

year. This specimen was determined as *sternata* by L. B. Parker, and I am able to confirm his identification. Subsequent scouting was not done, and it is not known whether this colony has maintained itself.

Tiphia totopunctata Allen & Jaynes

NEW YORK—Nassau (1927).

Fifteen mated females and 16 males were liberated for control of *Anomala orientalis* from cocoons from Korea. Apparently the species did not become established.

Tiphia vernalis Rohwer

CONNECTICUT—Fairfield (1936), Hartford (1938), Middlesex (1945), New Haven (1936), New London (1937), Windham (1938).

DELAWARE—Kent (1936), New Castle (1934).

DISTRICT OF COLUMBIA—(1934).

MARYLAND—Anne Arundel (1939), Baltimore (1934), Cecil (1934), Dorchester (1936), Frederick (1936), Harford (1938), Howard (1939), Kent (1938), Prince Georges (1939), Queen Annes (1939), Somerset (1938), Talbot (1939) Washington (1936), Wicomico (1938), Worcester (1938).

MASSACHUSETTS—Hampden (1932), Middlesex (1944), Worcester (1944).

NEW HAMPSHIRE—Cheshire (1937), Merrimac (1936), Strafford (1936).

NEW JERSEY—Atlantic (1936), Bergen (1940), Burlington (1926), Camden (1927), Cape May (1936), Cumberland (1934), Essex (1940), Gloucester (1932), Hunterdon (1935), Mercer (1932), Middlesex (1933), Monmouth (1933), Morris (1939), Ocean (1933), Passaic (1941), Salem (1932), Somerset (1933), Union (1937).

NEW YORK—Albany (1944), Broome (1946), Chemung (1939), Columbia (1944), Dutchess (1941), Livingston (1944), Monroe (1939), Nassau (1927), Ontario (1944), Orange (1940), Putnam (1942), Queens (1930), Rockland (1939), Saratoga (1944), Schuyler (1945), Seneca (1946), Staten Island (1937), Suffolk (1944), Tioga (1939), Tompkins (1944), Ulster (1943), Westchester (1939).

NORTH CAROLINA—Buncombe (1943), Henderson (1943).

OHIO—Cuyahoga (1941), Guernsey (1943), Mahoning (1945).

PENNSYLVANIA—Allegheny (1945), Berks (1936), Bucks (1929), Chester (1932), Clinton (1945), Cumberland (1934), Dauphin (1934), Delaware (1931), Lancaster (1940), Lehigh (1937), Luzerne (1943), Lycoming (1944), Monroe (1937), Montgomery (1927), Montour (1945), Northampton (1943), Northumberland (1944), Philadelphia (1930), Snyder (1944), Westmoreland (1944), York (1942).

RHODE ISLAND—Bristol (1944), Newport (1944), Providence (1936), Washington (1945).

VIRGINIA—Arlington (1941), Chseterfield (1941), Fairfax (1943), Henrico (1941), Loudoun (1944), Norfolk (1943), Spottsylvania (1942), Stafford (1945).

WEST VIRGINIA—Taylor (1941).

Scouting in 1945 and again in 1946 established that colonies over two years old were present in all States scouted except Rhode Island and the District of Columbia. No scouting was done in Ohio, North Carolina, Virginia, or West Virginia in either year. This species is an important factor in the control of *Popillia japonica* in the United States.

CUBAN FLATIDAE WITH NEW SPECIES FROM ADJACENT REGIONS

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This is one in a series of papers (Metcalf and Bruner 1925a, 1925b, 1930a, 1936a, and 1944a) devoted to a survey of the homopterous fauna of Cuba. The FLATIDAE is one of the larger families of the superfamily FULGOROIDEA. In our catalogue of this family there are recorded at the present time 184 genera and 894 species from various parts of the world. The number of species in the Palearctic fauna is small, and the Nearctic fauna has a limited number of species. But the Caribbean, Neotropical, Oriental, Ethiopian, Malaysian, Austro-Malayan and Australian faunas have a large number of species. The family is well represented in Cuba. The present paper records 16 genera and 42 species of which 9 genera and 32 species are believed to be new.

CHARACTERS OF THE FAMILY

This family may be characterized as follows: Body strongly compressed or depressed; tegmina and wings ample, held vertically or horizontally in repose. This character alone is sufficient to distinguish this family from the other families of superfamily FULGOROIDEA with the exception of the family ACANALONIIDAE in which the body is greatly compressed and the tegmina are ample and held vertically when at rest. And in the family ACHILIDAE all the species have the body greatly depressed. In the ACANALONIIDAE, however, there is no crossveined costal area and the hind tibiae are without lateral spines. In the ACHILIDAE there is no costal area, and the second tarsus of hind legs is not small. Other characters of the family FLATIDAE may be stated briefly as follows: Head small; compound eyes large, ventral sinus inconspicuous or wanting; two ocelli in the lateral compartments, ventrad to the compound eyes; antennae inconspicuous, first segment usually small, collarlike, second segment longer, somewhat capitate, flagellum long; crown short, usually no distinct cephalic process sometimes triangularly or conically produced; pronotum usually short and broad, separated into a distinct central area and lateral areas by a pair of very distinct intermediate carinae; mesonotum large, frequently tricarinate; tegmina large, vertical or horizontal; a distinct crossveined costal area; venation distinct but reticulate and irregular; legs simple, first and second pairs usually short; hind tibiae elongate with one or more spines usually on the apical third; second hind tarsus short with a pair of spines on the apical margin. The male genitalia furnish the most reliable specific characters; pygofer usually short and simple; genital plates large, united basad and with a large tooth on the dorsal margin; aedeagus usually tubular, elongate, straight or curved with an apical pair of spines, a preapical pair of spines and a subapical pair of spines; anal segment usually elongate, broad, and flat with apical portion often strongly deflexed, hoodlike, covering the rest of the genitalia; female

genitalia simple and incomplete. The lateral valvifers are large with rows of teeth along the inner ventral margin; ovipositor short, usually curved.

We wish to acknowledge the assistance of many collectors, whose names will be indicated in the text by their initials only, as follows:

J. A.—J. Acuna
B. T. B.—B. T. Barreto
C. H. B.—C. H. Ballou
L. B. León Bouclé
S. C. B.—S. C. Bruner
P. G. C.—P. G. Cardin
A. C.—Arturo Comas
E. D.—E. Ducasse
M. J.—Miguel Jaume
A. R. O.—A. R. Otero
L. C. S.—L. C. Scaramuzza
G. C. R.—G. C. Rowe
E. A. S.—E. A. Schwarz
F. S.—F. Silvestri
C. F. S.—C. F. Stahl
F. Z.—F. de Zayas

The types of all new forms are in the collection of the senior author.

KEY TO THE GENERA OF CUBAN FLATIDAE

A. Tegmia vertical or steeply tectiform.....Subfamily **Flatinae**
B. Tegmina broadly rounded apically, costal and apical margins merging.....Tribe **Phantiini** (*Byllisana* Metc. and Brun.)
BB. Tegmina with costal and apical margins distinct.
C. Tegmina broadly triangular..... 1
1. Sutural angle triangularly produced or distinctly rectangular.....Tribe **Flatissini.** 2
1. Sutural angle rounded.....Tribe **Nephesini.** 4
2. Crown triangular, distinctly produced..**Carthaeomorpha** Mel. (Central and South American species.)
2. Crown obtuse, not produced, shorter on median line than on lateral margins..... 3
3. Frons longer than broad with a pair of impressed points on dorsal margin; pronotum with a distinct median carina; sutural angle of tegmina distinctly produced. **Dakshiana** Metc. and Brun.
3. Frons broader than long, no impressed points; pronotum ecarinate with a pair of impressed points; sutural angle rectangular, not produced.....**Monoflatina** Metc. and Brun. (Jamaican species.)
4. Sutural angle distinctly produced; apical margin sinuate. **Leocerus** Metc. and Brun.
4. Sutural angle not produced; apical margin truncate..... 5
5. A single subapical line on corium..... 6
5. Two distinct subapical lines on corium.....**Ormenis** Stål
6. Costal margin distinctly longer than sutural margin; apical angle produced caudad beyond sutural angle. **Ormenaria** Metc. and Brun.
6. Costal and sutural margins about equal; apical angle not produced caudad..... 7
7. Frons broader than long or as broad as long..... 8
7. Frons distinctly longer than broad..... 9
8. Pronotum almost completely covering vertex. **Ormenana** Metc. and Brun.
8. Vertex not covered by pronotum.....**Monoflata** Mel.
9. Only a few of the longitudinal veins forked beyond subapical line.....**Ormenoides** Mel.
9. Most of the longitudinal veins forked beyond the subapical line.....**Melormenis** Metc.
CC. Tegmina narrow; costal margin sinuate.....Tribe **Selizini.** 1
1. Tegmina broad across humeri, narrowed caudad; apical margin sinuate; apical angle produced caudad..**Cyarda** Walk.
1. Tegmina about same width throughout; apical margin truncate; apical angle not produced. **Planodascalia** Metc. and Brun.

AA. Tegmina horizontal or nearly so.....Subfamily **Flatoidinae**
B. Subcostal vein and costal margin of tegmina undulate; tegmina not narrowed caudad.
C. Crown distinctly broader than long, composed in great part of the reflexed portion of frons.....**Flatarissa** Metc. and Brun.
CC. Crown distinctly longer than broad, composed entirely of vertex.....**Pseudoflatoides** Metc.
BB. Costal vein and costal margin not undulate; tegmina usually narrowed caudad.
C. Dorsal margin of frons triangularly incised.
Flatidula Metc. and Brun.
CC. Dorsal margin of frons straight or nearly so..... 1
1. Crown about as long as broad, anterior margin obtuse.
Flatarina Metc. and Brun.
1. Crown much broader than long, anterior margin triangularly produced.....**Flatoidinus** Mel.

Genus **Byllisana** nov.

Orthotype **Byllisana brunnea** n. sp.

Orthotype *Byllisana brunnea* n. sp.

This is the second American genus of the Tribe *Phantiini*. In this tribe the costal margin curves imperceptibly into the apical margin and there is no distinct apical angle.

Head including compound eyes as broad as pronotum; vertex short and completely covered by pronotum except lateral angles; frons about as broad as long; tegmina broad and short; apical angle broadly rounded; costal margin merging imperceptibly into apical margin; costal area about as wide as costal cell; costal vein merging into the subapical line which is parallel to apical margin; cubitus one furcate basad to radius; the subapical line parallel to apical margin; second branch of radius and media furcate at about same level; most of longitudinal veins simple beyond subapical line; hind tibiae with two spines on apical third.

Byllisana brunnea n. sp.

(Pl. VI, figs. 3, 6; Pl. XIV, figs. 3, 6)

This is a small species almost uniformly cinnamon brown in color with the carinae of the head, thorax and legs bright ochraceous buff.

Vertex short, almost completely covered by the extended pronotum; lateral compartments triangular; dorsal area of frons impressed; frons slightly broader than long; dorsal margin longer than clypeal margin; lateral margins strongly arched, widest at about the level of antennae, strongly reflexed; median carina inconspicuous; clypeus about as long as frons, the frontal margin deeply impressed; pronotum slightly broader than compound eyes; anterior margin distinctly projected; posterior margin deeply incised; mesonotum broad and flat, tricarinate; tegmina with costal margin broadly arched into apical margin; venation distinct and variable with few crossveins, except in costal area and beyond subapical line.

Male genitalia with pygofer short and broad; genital plates broad, elongate, dorsal apical tooth somewhat elongate, recurved, acute; aedeagus with a pair of subapical, elongate spines placed near ventral margin; apical spines, which are about half as long as subapical spines

somewhat undulate; anal segment elongate with a very large ventral apical plate.

General color cinnamon or cinnamon brown with lateral margins of frons, carina on thorax, and costal margin of tegmina usually light ochraceous buff. Recently emerged adults are covered with a white pruinescence which soon disappears more or less by abrasion.

Length to apex of tegmina: 3.75–4.50 mm.

Holotype ♂: Santiago de las Vegas, Habana Prov.; S. C. B. *Allotype* ♀: Santiago de las Vegas, Habana Prov.; S. C. B. *Paratypes:* 2 ♂♂, Habana, Habana Prov.; 22 Apr., 1916; S. C. B. 3 ♀♀, Habana, Habana Prov.; 22 Apr., 1916; S. C. B. 1 ♂, Marianao, Habana Prov.; 7 Dec., 1921; S. C. B. 1 ♀, Marianao, Habana Prov.; 30 Jan., 1927; S. C. B. 1 ♂, Mangas, Pinar del Rio Prov.; 6 June, 1937; S. C. B. and L. C. S. 1 ♂, Alquizar, Habana Prov.; 9 June, 1934; L. C. S. 1 ♂, Central Moron, Camagüey Prov.; 24 March, 1927; S. C. B. 1 ♂, Sierra Rangel Mts., Pinar del Rio Prov.; 29 Aug., 1927; 1500 ft.; J. A. and S. C. B. 1 ♀, Vinales, Pinar del Rio Prov.; 15 Apr., 1930; S. C. B. 1 ♀, Vinales, Pinar del Rio Prov.; 15 Apr., 1930; S. C. B. 1 ♂, Vinales, Pinar del Rio Prov.; 7 Apr., 1922; S. C. B. and J. A. 7 ♀♀, Santiago de las Vegas, Habana Prov.; 5 Feb., 1927; S. C. B. 1 ♀, Central Cuba, Matanzas Prov.; 25 March, 1927; S. C. B. 1 ♀, Vibora, Habana Prov.; 10 Jan., 1929; S. C. B. 1 ♀, Benavides, Matanzas Prov.; 11 June, 1932; S. C. B., A. R. O. and L. C. S. 1 ♀, Cape Baragua, Camagüey Prov.; 11 July, 1939; L. C. S. 1 ♀, Jaronu, Camagüey Prov.; 1 June, 1934; L. C. S. 1 ♂, Vento, Habana Prov.; 28 Nov., 1920; J. A.

It has been found breeding on *Centrosoma* sp. and *Miebomia supina* growing on dry savannas.

Genus **Carthaeomorpha** Melichar

(Melichar 1901a: 198)

Logotype *Carthaemorpha rufipes* Melichar, Oshanin 1912a: 125.

Crown broad and short; anterior and posterior margins nearly parallel, broadly curved with a distinct carina separating the crown from frons; frons slightly longer than broad, flat; lateral margins strongly elevated, broadly curved; median carina distinct dorsad; tegmina large, apex truncate; sutural angle strongly produced; venation reticulate, longitudinal veins distinct; costal cell broader than costal area, media branched before the first cubital sector; hind tibiae with two spines on apical third.

Carthaeomorpha balloui n. sp.

(Pl. I, fig. 6; Pl. VI, fig. 7; Pl. XIV, figs. 9, 10)

This is a rather large species of a general light olive green color; the veins of the tegmina and the pustules on the clavus are darker olive

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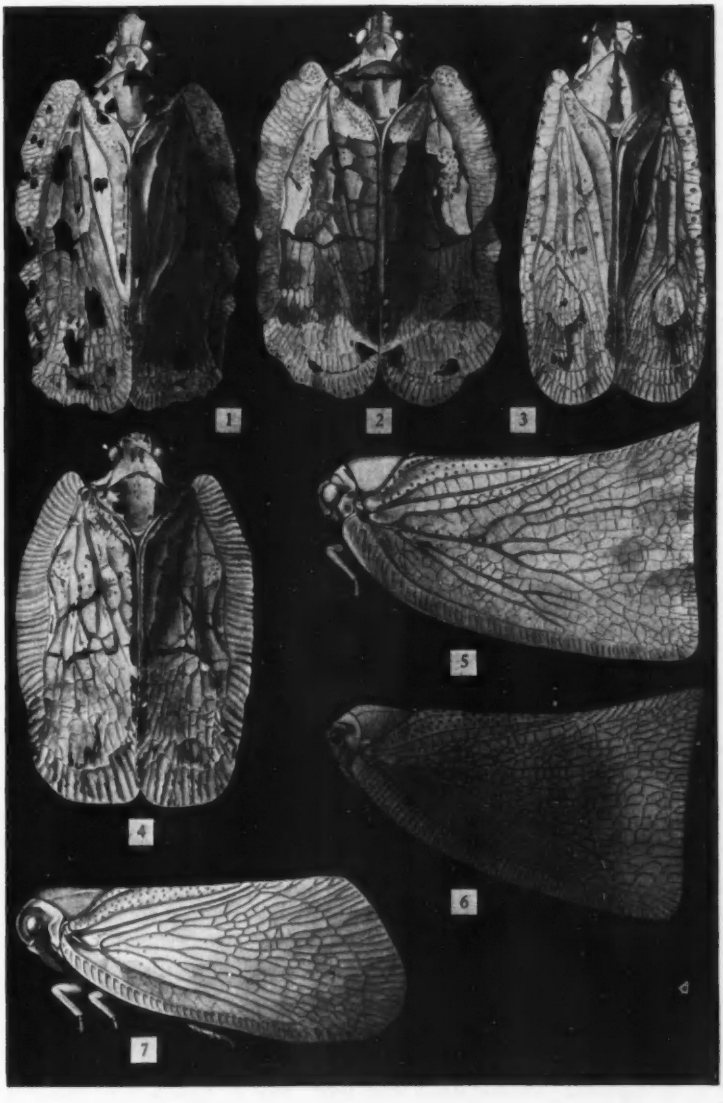
EXPLANATION OF PLATE I

Fig. 1. *Pseudoflatoides fasciculosus* var. *maculosus* Metc. and Brun. Fig. 2. *Pseudoflatoides lichenoides* Metc. and Brun. Fig. 3. *Flatidula pallescens* Metc. and Brun. Fig. 4. *Flatarissa variegata* Metc. and Brun. Fig. 5. *Dakshiana katharina* Metc. and Brun. Fig. 6. *Carthaeomorpha balloui* Metc. and Brun. Fig. 7. *Ormenaria rufifascia* Walk.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green; tipe of the tibiae and the entire tarsi ochraceous orange; lateral area of the mesonotum and the posterior half ochraceous orange.

Vertex broad and flat, about two and one-half times as broad as median length separated from frons by a distinct transverse carina; median carina fairly distinct; frons about half again as long as its greatest width; lateral margins strongly elevated, nearly straight and somewhat diverging to the level of the antennae, then converging to the smaller clypeus; median and intermediate carinae about one-half as long as frons, fairly distinct; pronotum short, broad, the anterior margin carinate, broadly curved, posterior margin deeply incised; median carina distinct; intermediate carinae indistinct; mesonotum large, tricarinate; tegmina large, sutural angle strongly produced, uniformly reticulate; costal cell broader than costal margin with numerous crossveins; hind tibiae with two stout spines on apical third.

Male genitalia with genital plates when viewed ventrally elongate, about six times as long as greatest width; apical margin obtuse, when viewed laterally broadly triangular, with a distinct apical tooth; aedeagus large, with a short bifurcate apical tooth and an elongate subapical tooth; anal segment elongate.

Length to apex of tegmina: 13.00–13.30 mm.

H*olotype* ♂: San Pedro de Montes de Oca, Costa Rica, on *Amygdalus persica*; 20 Feb., 1933; C. H. B. *Allotype* ♀: San Pedro de Montes de Oca, Costa Rica, on *Amygdalus persica*; 1 Sept., 1933; C. H. B. *Paratypes:* 1 ♂, San Pedro de Montes de Oca, Costa Rica, on *Amygdalus persica*; 21 March, 1933; C. H. B.

Genus **Dakshiana** nov.

Orthotype *Dakshiana katharina* n. sp.

This genus is characterized by a short crown, large tegmina, with sutural angle strongly produced. It is close to *Carthaeomorpha* Mel. but differs in essential characters as indicated below.

Crown very short, all except the lateral anterior angles, nearly covered by pronotum; anterior margin sinuate, not parallel to posterior margin; face broader than long; lateral margins strongly elevated; median carina fairly distinct dorsad, fading out ventrad; pronotum with dorsal area about twice as broad as long; median carina percurrent, lateral margins strongly elevated; anterior margin truncate; posterior margin shallowly excavate; mesonotum large, tricarinate; tegmina large, the costal area narrow with numerous crossveins; corium finely reticulate over the whole surface; apical margin slightly concave, apical angle rounded, sutural angle strongly produced.

EXPLANATION OF PLATE II

Fig. 1. *Flatoidinus acutus* Uhl. Fig. 2. *Flatidula luella* Metc. and Brun. Fig. 3. *Flatoidinus olivaceus* Metc. and Brun. Fig. 4. *Planodascalia viridicosta* Metc. and Brun. Fig. 5. *Planodascalia viridicosta* Metc. and Brun. Fig. 6. *Melormenis asymmetrica* Metc. and Brun.

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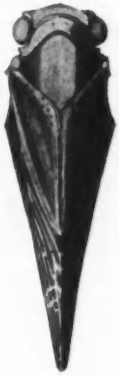

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Dakshiana katharina n. sp.

(Pl. I, fig. 5; Pl. VI, figs. 2, 5; Pl. XIV, figs. 5, 7)

The fresher specimens of this species appear to be nearly uniform pale dull greenish with the tegmina lightly powered with a whitish pruinescence. The older specimens fade to light ochraceous buff with the veins, carinae, and margins of legs bright red.

Crown very short; lateral margins strongly elevated, separated from frons by a very distinct transverse carina; frons with the margins nearly parallel to below antennae, then curving inward to the smaller clypeus; lateral margins strongly elevated; median carina fairly distinct dorsad; legs short; pronotum with anterior margin projecting cephalad to level of anterior margin of compound eyes; posterior margin broadly sinuate; median carina strongly elevated; lateral margins strongly elevated, curving outward and then ventrad parallel to margin of compound eyes; mesonotum broad, tricarinate; tegmina closely reticulate over entire surface; costal area with numerous closely arranged crossveins, narrower than costal cell; sutural angles strongly acutely triangularly produced; apical angle short, broadly rounded.

Male genitalia plates when viewed ventrad broad, nearly quadrangular; pygofer small; anal segment large with a large triangular ventral plate; genital plates when viewed laterad with a strong apical dorsal tooth; aedeagus rather large, with an elongate recurved apical spine which has a midventral short spine; there is also an elongate twisted lateral spine on aedeagus.

Length to apex of tegmina: ♂, 9.25 mm., ♀, 12.25 mm.

Holotype ♂: Calabazar, Habana Prov., on *Nectandra coriacea* Gris.; 5 Aug., 1928; S. C. B. *Allotype* ♀: Loma del Gato, Oriente Prov.; 1–2 Oct., 1935; 2600–3325 ft.; J. A. and S. C. B. *Paratypes*: 1 ♂, San Blas, Santa Clara Prov.; Oct., 1931; G. C. R. 1 ♂, Calabazar, Habana Prov., on *Nectandra coriacea* Gris.; 5 Aug., 1928; S. C. B. 1 ♂, Sierra Maestra, Oriente Prov.; 10–20 July, 1922; 3100–4000 ft.; C. H. B. and S. C. B. 1 ♂, Las Animas, Sierra Rangel Mts., Pinar del Rio Prov.; May, 1933; 1500 ft. 2 ♀♀, Santiago de las Vegas, Habana Prov.; 24 Oct., 1915; S. C. B. 1 ♀, Sierra Rangel Mts., Pinar del Rio Prov.; 29 Aug., 1927; 1500 ft.; J. A. and S. C. B. 1 ♀, Calabazar, Habana Prov., on *Nectandra coriacea* Gris.; 5 Aug., 1928; S. C. B. 1 ♀, Nagua, Oriente Prov.; 7 July, 1922; S. C. B. and C. H. B.

Genus **Monoflata** Melichar

(Melichar 1923a: 76)

Orthotype *Poekilloptera brasiliensis* Spinola.

This genus was established to include *Poekilloptera brasiliensis* Spinola from Brazil and *Ormenis pallescens* from Mexico. This genus

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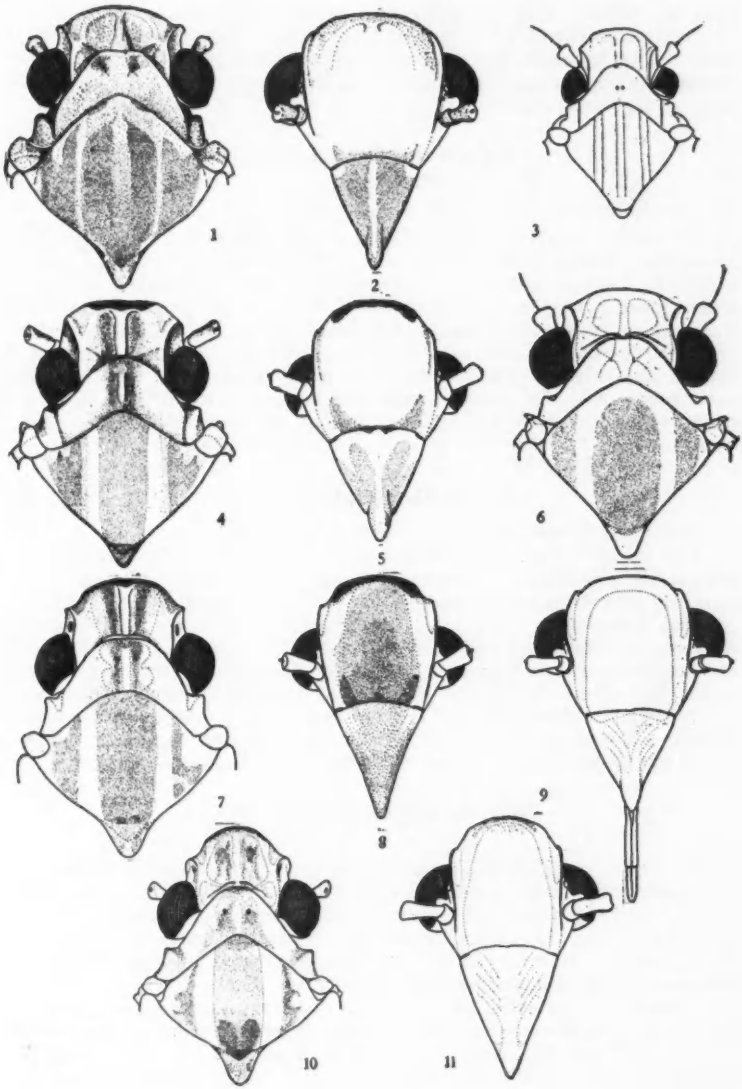
EXPLANATION OF PLATE III

Frontal Views of Head, Dorsal Views of Head and Thorax

Fig. 1. *Cyarda acuminipennis* Spin. Fig. 2. *Cyarda acuminipennis* Spin. Fig. 3. *Cyarda acutissima* Metc. and Brun. Fig. 4. *Cyarda cubensis* Metc. and Brun. Fig. 5. *Cyarda cubensis* Metc. and Brun. Fig. 6. *Cyarda walkeri* Metc. Fig. 7. *Cyarda fuscifrons* Metc. and Brun. Fig. 8. *Cyarda fuscifrons* Metc. and Brun. Fig. 9. *Cyarda walkeri* Metc. Fig. 10. *Cyarda melichari* Van D. Fig. 11. *Cyarda melichari* Van D.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is a very distinct genus of the *Ormenis* group with a fairly broad face with the lateral margins broadly arcuate, strongly elevated and united to the median carina by a distinct transverse carina at the apex of the head. The tegmina are distinctly widened apically, venation very distinct, a single subapical line forming numerous apical cells about as long as the costal cells.

Monoflata perpusilla Fowler
(Pl. V, figs. 7, 10)

Flata perpusilla Fowler 1900f: 53; Pl. 7, fig. 16.

We have a single female specimen of this species from St. Lorenzo, Honduras; 7 Apr., 1923; C. H. B. The head and thorax is chiefly brownish fuscous with crown, pronotum and mesonotum dorsally bright green fading to greenish yellow; lateral margins of pronotum and mesonotum brownish fuscous and apical angle of mesonotum also brownish fuscous; midline of crown, pronotum and mesonotum broadly vittate with bright scarlet red; tegmina bright green, faintly dotted with paler green, with the costal, apical, and sutural margins from apex of clavus to sutural angle, the humeral margin, and apex of clavus marked with fuscous.

Genus **Monoflatina** nov.

Orthotype *Monoflatina viridipennis* n. sp.

This seems to be a very distinct genus of the Tribe Flatissini. The sutural angle is distinctly rectangular but not produced; subapical line wanting; pronotum covers most of crown, broadly produced on anterior margin, bipunctate, ecarinate; mesonotum very large, indistinctly tricarinate; frons broad and short with lateral margins slightly elevated; median intermediate carinae distinct on dorsal half; tegmina large; costal area about three times as broad as costal cell; venation distinct but irregular; radius branched beyond branching of media; media with usually four branches distinct; first cubital sector branched before branching of media; hind tibiae with two spines on apical third.

Monoflatina viridipennis n. sp.
(Pl. V, figs. 8, 11)

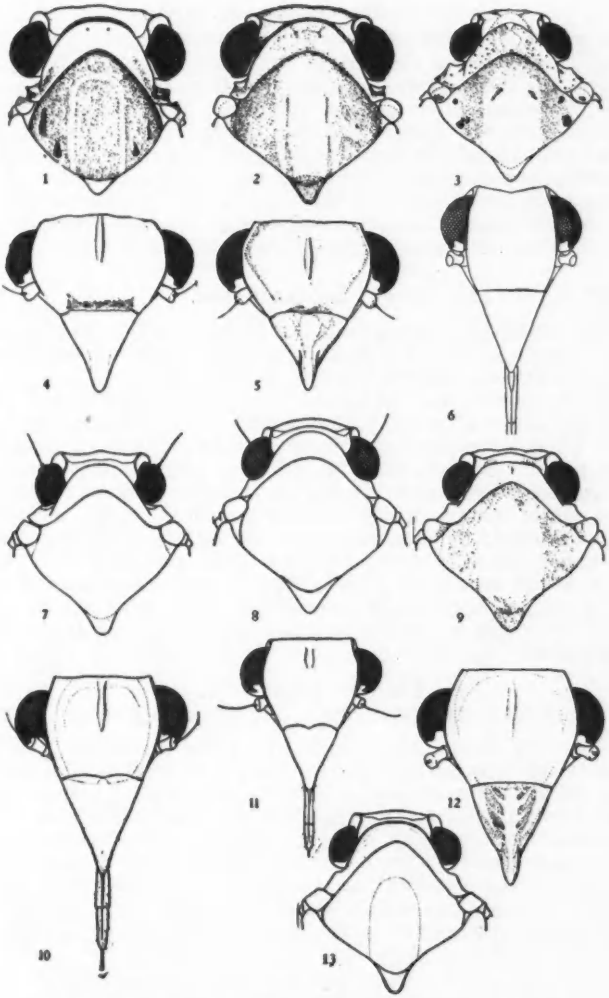
This is a pale greenish species indistinctly marked with tawny.

Crown very short, almost completely covered by extending pronotum, distinctly separated from frons by transverse carina; frons about as broad as long, tricarinate; lateral margins broadly curved; pronotum short, broadly projecting in front of compound eyes; mesonotum large, indistinctly tricarinate; tegmina large.

General color greenish with venation distinctly brighter green; head, pronotum, mesonotum, venter, and legs fading to tawny; compound eyes brown; tegmina with an indistinct border of brownish fuscous extending from humeral angles around apical margin to apex of clavus.

Length to apex of tegmina: 7.60 mm.

Holotype ♀ : Jamaica, 5 Oct., 1923; C. H. B.



Frontal Views of Head, Dorsal Views of Head and Thorax

Fig. 1. *Planodascalia viridicosta* Metc. and Brun. Fig. 2. *Planodascalia fusca* Metc. and Brun. Fig. 3. *Leocerus fuscus* Metc. and Brun. Fig. 4. *Planodascalia viridicosta* Metc. and Brun. Fig. 5. *Planodascalia fusca* Metc. and Brun. Fig. 6. *Leocerus fuscus* Metc. and Brun. Fig. 7. *Melormenis persea* Metc. and Brun. Fig. 8. *Melormenis asymmetrica* Metc. and Brun. Fig. 9. *Melormenis inconspicua* Metc. and Brun. Fig. 10. *Melormenis persea* Metc. and Brun. Fig. 11. *Melormenis asymmetrica* Metc. and Brun. Fig. 12. *Melormenis inconspicua* Metc. and Brun. Fig. 13. *Melormensis pruinosa cubana* Metc. and Brun.

Genus **Deocerus** nom. nov.

For *Neocerus* Melichar [1902] nec *Neocerus* Wasmann [1893].

Orthotype *Neocerus corniculatus* Melichar.

The genus *Neocerus* was proposed by Melichar in 1902 for a single species *Neocerus corniculatus* from Venezuela. This name, however, is preoccupied by the name *Neocerus* Wasmann. We are therefore proposing the above new name for this genus. Briefly the genus may be characterized as follows: Frons somewhat elongate with a distinct median carina; dorsal margin of the frons incised; tegmina elongate, the apical margin broadly sinuate sutural angle roundly produced, with a single distinct subapical line; hind tibiae with a single spine.

Genus **Leocerus** nov.

In the venation of the tegmina, this genus bears a superficial resemblance to *Juba* Jacobi. The head structures are entirely different and resemble in general *Deocerus* Metcalf and Bruner.

Head narrower than pronotum, the crown quadrilateral, about three times as broad as the median length; frons elongate, the lateral margins broadly curved; dorsal margin triangularly incised; dorsal and clypeal margins nearly equal; central area longitudinally depressed; pronotum projecting anteriorly beyond anterior margin of compound eyes; posterior margin deeply incised; mesonotum large, dorsal area broadly flattened; tegmina elongate, costal margin slightly sinuate, apical margin broadly sinuate; sutural angle produced and broadly rounded; costal area broad, broader than costal cell; numerous crossveins; two subapical lines about equidistant from each other and apical margin; whole area of corium reticulate; hind tibiae with two spines on apical third.

Leocerus fuscus n. sp.

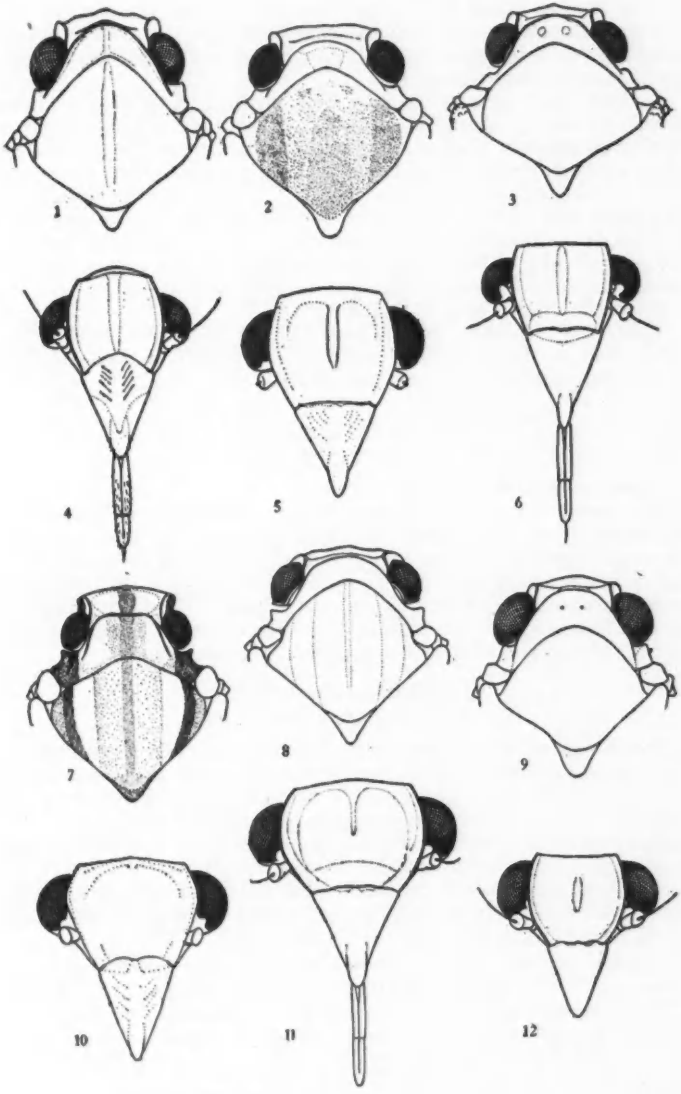
(Pl. IV, figs. 3, 6; Pl. VII, figs. 2, 4; Pl. XI, figs. 4, 7)

Crown very short, almost bisected by the projecting pronotum, anterior margin of which is much more sharply rounded than the carinate anterior margin between crown and frons; frons slightly longer than its greatest width, a weak median carina dorsad; dorsal and clypeal margins nearly equal, lateral margins strongly elevated, broadly curved; clypeus about as long as median length of frons; pronotum much wider than its median length, the posterior margin more sharply incised than curve of the anterior margin; mesonotum rather long, dorsal surface nearly flat, smooth and shiny; tegmina with numerous crossveins in apical area; the two subapical lines fairly distinct and continuous.

EXPLANATION OF PLATE V

Frontal Views of Head, Dorsal Views of Head and Thorax

Fig. 1. *Ormenaria rufifascia* Walk. Fig. 2. *Melormenis variegata* Metc. and Brun. Fig. 3. *Ormenoides subflava* Metc. and Brun. Fig. 4. *Ormenaria rufifascia* Walk. Fig. 5. *Melormenis variegata* Metc. and Brun. Fig. 6. *Ormenoides subflava* Metc. and Brun. Fig. 7. *Monoflata perpusilla* Fowl. Fig. 8. *Monoflatina viridi pennis* Metc. and Brun. Fig. 9. *Ormenana linki* Heid. and Osb. Fig. 10. *Monoflata perpusilla* Fowl. Fig. 11. *Monoflatina viridipennis* Metc. and Brun. Fig. 12. *Ormenana linki* Heid. and Osb.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Male genitalia with pygofer short and broad; genital plates about twice as long as broad with a distinct apical tooth on dorsal margin; aedeagus elongate, slender, with a single subapical, somewhat recurved spine; the tenth segment rather heavy basad, with apex beyond anal style narrow, strongly decurved.

General color light ochraceous buff, with the following markings fuscous or tawny: Anterior carina of crown and dorsal margin of frons, two indistinct lines either side of median area of pronotum, and numerous small punctate marks on pronotum, lateral areas of mesonotum, basal angle of clavus, costal margins, and most of the apical third of tegmina; there is also a series of narrow elongate dashes just inside the strongly carinate margins of frons; paratype is darker than holotype with general color of body ochraceous orange, and the darker markings blackish instead of tawny or fuscous, and more extensive.

Length to apex of tegmina: 7.00 mm.

Holotype ♂: Baracoa, Oriente Prov.; 21–30 Apr., 1929; S. C. B. and L. B. *Paratype:* Baracoa, Oriente Prov.; 15 July, 1935; F. Z. *Allotype* ♀: Los Llanos, Maisi, Oriente Prov.; 5 Feb., 1929; J. A.

Genus **Ormenis** Stål

(*Ormenis* Stål 1862e: 68)

Logotype *Ormenis perfecta* Walker.

This genus may be recognized by the following combinations of characters: Crown very short, partially concealed by projecting pronotum; frons broad, median carina indistinct; pronotum short, broad, usually bipunctate; mesonotum large; tegmina large with two subapical lines on corium; most of longitudinal veins forked beyond last subapical line; costal area wider than costal cell; apical and sutural angles equally rounded; hind tibiae with two stout spines on apical fourth.

Ormenis cubensis n. sp.

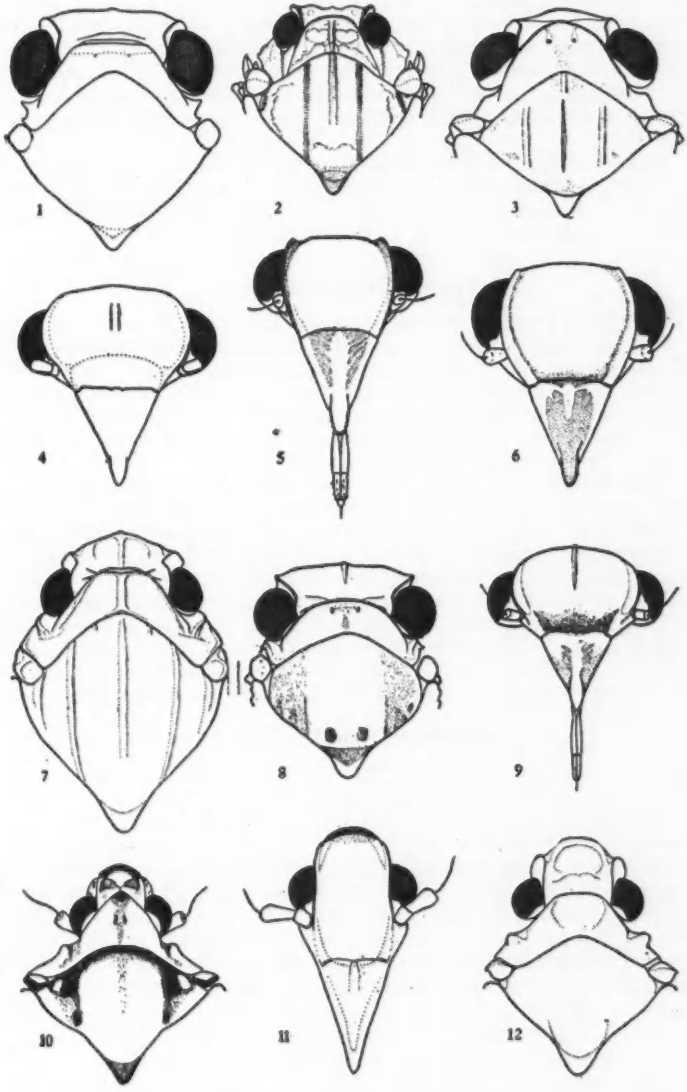
(Pl. VI, figs. 1, 4; Pl. XIII, figs. 10, 11)

This is a small species of *Ormenis*, nearly uniformly tawny olive in color, perhaps greenish in living specimens, with face and legs yellowish buff and a small black dot at apex of clavus and two small black dots on posterior lateral margins of mesonotum, the anterior pair larger; frons broader than long, the lateral margins not strongly elevated; median carina indistinct; tegmina long and narrow, costal margin three or four times as broad as costal cell; both subapical lines very distinct and about equidistant from each other and apical margin; most of longitudinal veins branched beyond last subapical line.

EXPLANATION OF PLATE VI

Frontal Views of Head, Dorsal Views of Head and Thorax

Fig. 1. *Ormenis cubensis* Metc. and Brun. Fig. 2. *Dakshiana katharina* Metc. and Brun. Fig. 3. *Byllisana brunneuas* Metc. and Brun. Fig. 4. *Ormenis cubensis* Metc. and Brun. Fig. 5. *Dakshiana katharina* Metc. and Brun. Fig. 6. *Byllisana brunneuas* Metc. and Brun. Fig. 7. *Carthaeomorpha balloui* Metc. and Brun. Fig. 8. *Planodascalia obscura* Metc. and Brun. Fig. 9. *Planodascalia obscura* Metc. and Brun. Fig. 10. *Flatarissa humeralis* Metc. and Brun. Fig. 11. *Flatarissa humeralis* Metc. and Brun. Fig. 12. *Flatarina aguiari* Metc. and Brun.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Male genitalia with pygofer somewhat elongate, the dorsal apical angle somewhat produced; genital plates elongate, nearly quadrate, about twice as long as broad, the dorsal apical angle produced in the short rounded tooth; aedeagus broad, somewhat curved, with short apical spines; preapical spines shorter than subapical spines; subapical spines elongate, curved; anal segment elongate, almost as long as pygofer and genital plates combined; apical area elongate, strongly deflexed.

Length to apex of tegmina: 6.90 mm.

Holotype ♂: San Blas, Trinidad Mts., Las Villas Prov.; 5 May, 1932; S. C. B. and A. R. O. *Allotype* ♀: San Blas, Trinidad Mts., Las Villas Prov.; 5 May, 1932; S. C. B. and A. R. O.

Genus **Ormenaria** nov.

Orthotype *Poekilloptera rufifascia* Walker.

This genus falls in that group of genera that include *Ormenoides* Mel. and *Melormenis* Metc., which have put a single subapical line on the tegmina and frons distinctly longer than broad. This genus is most closely related in these characters to *Melormenis* Metc., which has most of the longitudinal veins forked beyond the subapical line. It differs, however, in important respects, from this genus.

Head including compound eyes but little narrower than pronotum; crown very short; frons longer than broad; lateral margins nearly parallel to below antennae and then narrowing to the narrow postclypeus, strongly elevated; median carina of frons percurrent and continued distinctly on to clypeus; pronotum projecting cephalad to anterior margin of crown with a well-developed median carina; mesonotum tricarinate; tegmina elongate, narrow; venation very distinct; subapical line strongly developed, apical angle distinctly produced beyond sutural angle; costal area narrow, about as wide as costal cell; most of longitudinal veins furcate beyond subapical line; hind tibiae with two spines.

Ormenaria rufifascia Walker

(Pl. I, fig. 7; Pl. V, figs. 1, 4; Pl. XIII, figs. 7, 8)

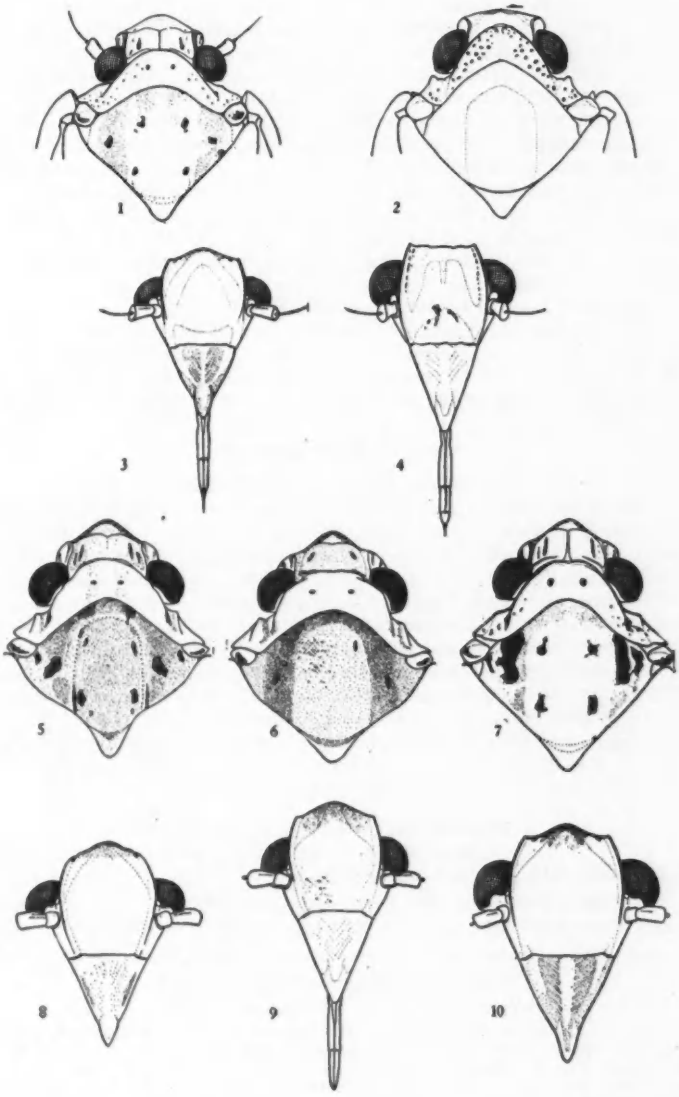
Poekilloptera rufifascia Walker 1851a: 458.
Ormenis rufifascia Melichar 1902a: 101.
Ormenis rufifascia Metcalf 1923a: 152; Pl. 38, fig. 10; Pl. 48, fig. 142.
Anormenis rufifascia Melichar 1923a: 69.

This species may be distinguished from other Cuban flatids by the following color characters: Head and thorax bright rufus marked with bright pale green; tegmina pale greenish with veins heavily marked with bright grass green; tegmina in the older specimens fade to light buff with veins ochraceous orange; the bright colors of head and thorax seem to be very well retained even in the older specimens.

EXPLANATION OF PLATE VII

Frontal Views of Head, Dorsal Views of Head and Thorax

Fig. 1. *Flatoidinus olivaceus* Metc. and Brun. Fig. 2. *Leocerus fuscus* Metc. and Brun. Fig. 3. *Flatoidinus olivaceus* Metc. and Brun. Fig. 4. *Leocerus fuscus* Metc. and Brun. Fig. 5. *Flatoidinus acutus* Uhl. Fig. 6. *Flatoidinus dotatus* Mel. Fig. 7. *Flatoidinus pallescens* Metc. and Brun. Fig. 8. *Flatoidinus acutus* Uhl. Fig. 9. *Flatoidinus dotatus* Mel. Fig. 10. *Flatoidinus pallescens* Metc. and Brun.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Crown reduced to two triangular lateral compartments beyond lateral margins of projecting pronotum; frons as long as broad; clypeus longer than frons; pronotum but little broader than head; anterior margin broadly produced to anterior margin of crown; posterior margin deeply incised; mesonotum about as broad as long, quadrangular, tricarinate; venation very distinct and fairly constant; subapical line distinct; most of the apical veins furcate beyond subapical line.

Male genitalia with genital plates short, broad, only about half as long as aedeagus or anal segment with a dorsal terminal elongate tooth, which is slightly recurved and acuminate; aedeagus long, slender with a pair of subterminal fleshy processes directed caudad and a pair of branched spines located on the apical third; the dorsal branch nearly straight; ventral branch strongly recurved and directed caudad; anal segment elongate, longer than aedeagus.

Length to apex of tegmina: 8.00–12.00 mm.

This species was described from Florida and has been recorded from Georgia. We have specimens from the Province of Pinar del Rio (W. T. Horne, C. H. B.) and the Isle of Pines (A. R. O.) taken on the Barrel Palm, *Colpothrinax wrightii*, and on Palmetto Palm, *Sabal* sp.

Genus **Ormenana** nov.

Orthotype *Ormenis linki* Heidemann and Osborn.

This genus is close to *Melormenis* Metc. Head including compound eyes nearly as wide as pronotum; crown short and broad; vertex almost completely concealed by the extended pronotum, separated from the coronal part of frons by a fine but distinct transverse carina; frons lyre-shaped, about as broad as long, sometimes slightly longer than broad, with dorsal and clypeal margins nearly equal; a distinct median carina; pronotum with anterior margin broadly projecting well in front of compound eyes; posterior margin broadly excavate; tegmina elongate, narrow, almost of equal width from humeral angles to apex; costal and sutural angles about equal; costal area narrower than costal cell with numerous crossveins; a single subapical line; most of the longitudinal veins forked beyond apical line; basal half of tegmina with few or no crossveins, apical half with a few irregular crossveins.

Ormenana linki Heidemann and Osborn

(Pl. V, figs. 9, 12; Pl. XIV, fig. 4)

Ormenis linki Heidemann and Osborn 1917a: 347.

This species was described from the Isle of Pines. We have specimens from the same locality with examples from practically every

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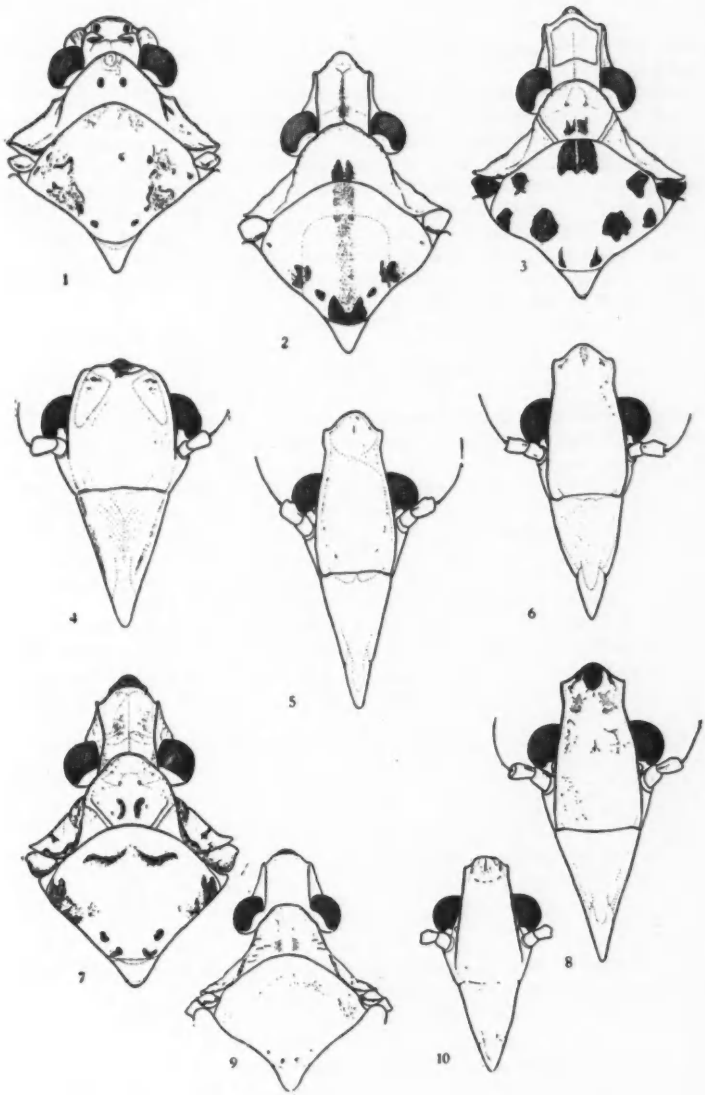
EXPLANATION OF PLATE VIII

Frontal Views of Head, Dorsal Views of Head and Thorax

Fig. 1. *Flatarissa variegata* Metc. and Brun. Fig. 2. *Pseudoflatoides fasciculosus* var. *griseus* Mel. Fig. 3. *Pseudoflatoides fasciculosus* var. *maculosus* Metc. and Brun. Fig. 4. *Flatarissa variegata* Metc. and Brun. Fig. 5. *Pseudoflatoides fasciculosus* var. *griseus* Mel. Fig. 6. *Pseudoflatoides fasciculosus* var. *maculosus* Metc. and Brun. Fig. 7. *Pseudoflatoides fasciculosus* Mel. Fig. 8. *Pseudoflatoides fasciculosus* Mel. Fig. 9. *Pseudoflatoides tortrix* var. *insularis* Mel. Fig. 10. *Pseudoflatoides tortrix* var. *insularis* Mel.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region where extensive collections have been made from Pinar del Rio Province to Oriente Province. It may be recognized by its small size, almost uniform fuscous brown color with the costal area pale ochraceous buff.

Head including compound eyes about as wide as pronotum; vertex very short, its greatest width nearly ten times the median length, lateral margins strongly elevated; frons slightly longer than greatest width, lateral margins strongly elevated; median carina faint with a pair of faint intermediate carinae; tegmina elongate, narrow, venation distinct.

Male genitalia with pygofer short and broad; genital plates short, broad, somewhat triangular, dorsal tooth on base of apical third, elongate; aedeagus with a pair of short apical spines and a pair of short subapical spines; anal segment elongate, deflexed, with a pair of lateral projections at about the middle.

Length to apex of tegmina: 4.75–5.00 mm.

Ormenana nana n. sp.

(Pl. XIII, fig. 2)

This species resembles *Ormenana linki* in general structure. It differs in averaging somewhat larger and is decidedly lighter in color than that species.

Crown very short and broad, almost completely covered by the projecting pronotum; face about as broad as long, lateral margins strongly arched; median carina very short; pronotum strongly and broadly produced on anterior margin, surpassing anterior margin of compound eyes; posterior margin broadly incised; mesonotum large; tegmina elongate, venation indistinct; subapical line not very evident.

Male genitalia with pygofer short and broad; genital plates short and broad; dorsal tooth near apex elongate, acuminate, slightly recurved; aedeagus short and stout; apical spines hooklike; preapical spines very short; subapical spines longer than apical spines, straight; tenth segment elongate, deflexed.

General color fuscous brown, the anterior margin of pronotum, lateral margins of frons, the legs and venter generally lighter; costal margin distinctly lighter.

Length to apex of tegmina: 6.10 mm.

Holotype ♂: Baragua, Camaguey Prov.; 3 Oct., 1924; C. F. S. *Allotype* ♀: Manzanillo, Oriente Prov.; 16 Oct., 1928; L. C. S. *Paratypes:* 1 ♀, Manzanillo, Oriente Prov.; 16 Oct., 1928; L. C. S.

Ormenana fusca n. sp.

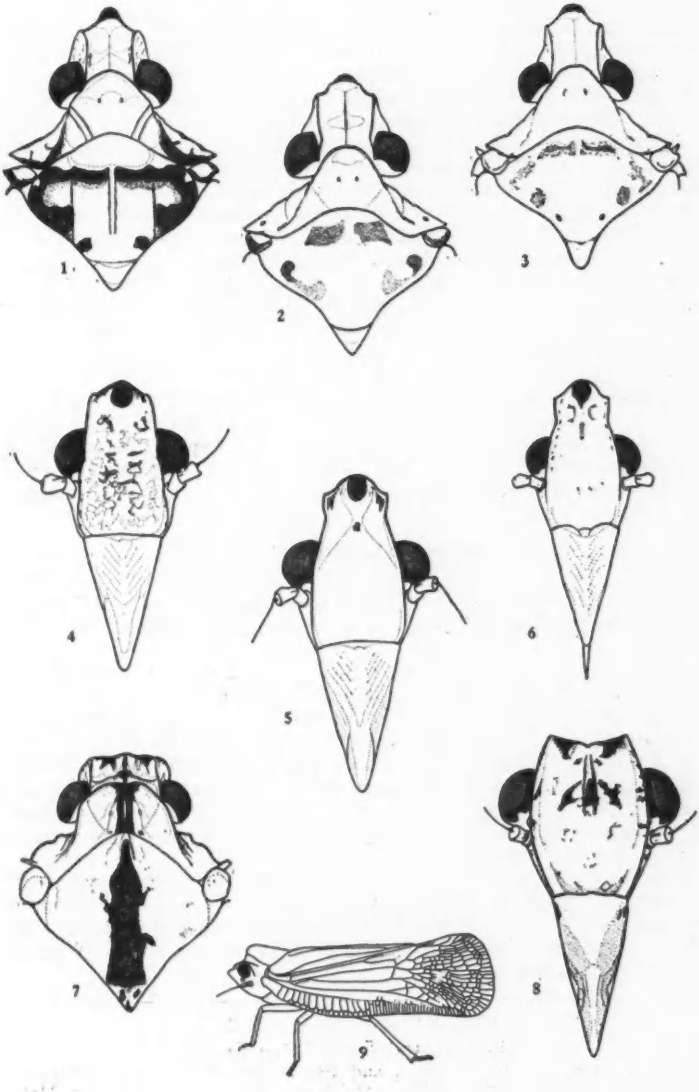
(Pl. XIII, fig. 9)

This species closely resembles *Ormenana linki* in general structure and coloration but the genitalia are distinct.

EXPLANATION OF PLATE IX

Frontal Views of Head, Dorsal Views of Head and Thorax

Fig. 1. *Pseudoflatoides lichenoides* Metc. and Brun. Fig. 2. *Pseudoflatoides fasciculosus* var. *vittatus* Metc. and Brun. Fig. 3. *Pseudoflatoides tortrix* Guér.-Mén. Fig. 4. *Pseudoflatoides lichenoides* Metc. and Brun. Fig. 5. *Pseudoflatoides fasciculosus* var. *vittatus* Metc. and Brun. Fig. 6. *Pseudoflatoides tortrix* Guér.-Mén. Fig. 7. *Flatidula luella* Metc. and Brun. Fig. 8. *Flatidula luella* Metc. and Brun. Fig. 9. *Flatidula luella* Metc. and Brun.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Vertex short and broad, lateral margins strongly and sharply elevated; frons slightly longer than broad, lateral margins strongly elevated and broadly curved with an indistinct median carina on basal third connected to a broadly elevated transverse carina; costal area narrower than costal cell; venation fairly distinct; subapical line distinct; apical and sutural angles equally rounded, apical margin obtuse; hind tibiae with two spines on apical third.

Male genitalia with pygofer short and broad; genital plates nearly twice as long as their greatest width, excluding dorsal tooth, longer than in *linki*, more slender; aedeagus with apical spines elongate with a short tooth on base; subapical spines elongate, curved, almost as long as aedeagus; anal segment elongate, slender, strongly deflexed on apical half; lateral processes broad, nearly quadrate.

In general color head and thorax dorsally russet brown; tegmina blackish fuscous with costal margin and claval suture ochraceous buff; face and legs chiefly ochraceous buff with abdomen russet brown; compound eyes tawny.

Length to apex of tegmina: 5.00–5.25 mm.

Holotype ♂: Banes, Oriente Prov.; 4–11 June, 1927; F. T. B. *Allotype* ♀: Manzanillo, Oriente Prov.; 16 Oct., 1928; L. C. S. *Paratypes:* 1 ♂, Central Palma, Oriente Prov.; 11 Sept., 1934; L. C. S. 1 ♀, Maisi, Oriente Prov.; 5 Feb., 1929; J. A. 1 ♀, Central Palma, Oriente Prov.; 11 Sept., 1934; L. C. S. 1 ♀, Camagüey, Camagüey Prov.; 8 July, 1923; J. A.

Ormenana punctata n. sp.

(Pl. XII, fig. 3)

This is a small species of *Ormenana* suggestive of *Melormenis pruinosa*, but differs in being much smaller and in having different genitalia.

Frons about as broad as long, median carina indistinct, the lateral margins strongly elevated, broadly curved; tegmina relatively broad and short; costal area broad with numerous closely spaced crossveins.

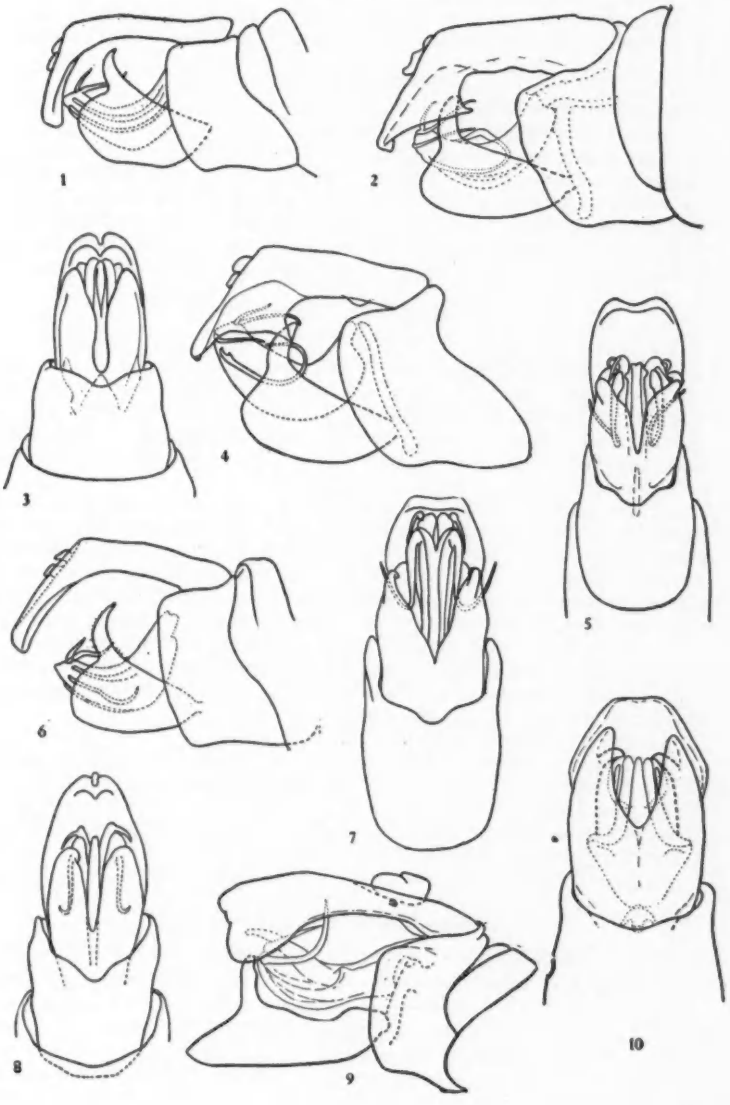
Male genitalia with pygofer short; genital plates short and broad with an elongate subapical dorsal tooth; aedeagus large with branched apical spines with anterior branch shorter; elongate subapical spines almost as long as aedeagus; anal segment nearly as long as pygofer and genital plates combined; apical portion elongate, slender when viewed laterally, curvingly deflexed.

Head, pronotum, venter, and legs chiefly light ochraceous buff; mesonotum and tegmina chiefly blackish fuscous; claval suture narrowly ochraceous buff; costal margin narrowly ochraceous buff; a small spot in front of the humeri, a larger spot behind the humeri, and an elongate stigmatal spot ochraceous buff.

EXPLANATION OF PLATE X

Lateral and Ventral Views of Male Genitalia

Fig. 1. *Cyarda acutissima* Metc. and Brun. Fig. 2. *Cyarda acuminipennis* Spin. Fig. 3. *Cyarda acutissima* Metc. and Brun. Fig. 4. *Cyarda walkeri* Metc. Fig. 5. *Cyarda acuminipennis* Spin. Fig. 6. *Cyarda cubensis* Metc. and Brun. Fig. 7. *Cyarda walkeri* Metc. Fig. 8. *Cyarda cubensis* Metc. and Brun. Fig. 9. *Flatarissa variegata* Metc. and Brun. Fig. 10. *Flatarissa variegata* Metc. and Brun.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Length to apex of tegmina: 5.50 mm.

Holotype ♂: Baracoa, Oriente Prov.; 15 April, 1916; P. G. C. *Paratypes:* 2 ♂♂, Baracoa, Oriente Prov.; 15 April, 1916; P. G. C.

Ormenoides Melichar

Ormenoides Melichar 1923a: 73.

Orthotype *Ormenoides distinctus* Mel.

This genus may be recognized by the following combinations of characters: Crown very short and broad, almost completely covered by extended pronotum; frons distinctly longer than broad; median carina usually distinct; pronotum short and broad, usually triangularly projecting between compound eyes; tegmina with single subapical line usually parallel to apical margin; costal area narrower than costal cell.

Ormenoides subflava n. sp.

(Pl. V, figs. 3, 6; Pl. XIV, fig. 1)

This is a medium-sized species of *Ormenoides* which is almost uniformly tawny orange in color. In some specimens there is a faint clouding of brown on lateral areas of mesonotum, the basal area of clavus, across basal cells and on apical area of tegmina. Other specimens are nearly uniformly warm sepia. The costal margin is nearly always paler than any other area of the body.

Crown almost completely covered by pronotum, separated from frons by a very distinct transverse carina; frons somewhat longer than broad; lateral margins strongly elevated; median carina distinct; pronotum distinctly produced, the anterior margin transverse; posterior margin shallowly excavate; mesonotum without distinct carina; tegmina short and broad; costal margin nearly straight; apical margin truncate.

Male genitalia with genital plates elongate, narrow, with a well-developed recurved middorsal tooth; aedeagus elongate, slender, with short apical spines with basal tooth; subapical spines slender, elongate, about half as long as aedeagus, somewhat recurved.

Length to apex of tegmina: 7.75–8.25 mm.

Holotype ♂: Sierra Maestra, Oriente Prov.; 10–20 July, 1922; C. H. B. and S. C. B. *Allotype* ♀: Sierra Maestra, Oriente Prov.; 10–20 July, 1922; C. H. B. and S. C. B. *Paratypes:* 3 ♂♂ and 3 ♀♀, Sierra Maestra, Oriente Prov.; 10–20 July, 1922; C. H. B. and S. C. B. 1 ♀, Pico Turquino, Oriente Prov.; 1 Aug., 1935; 4000–6000 ft.; J. A. 1 ♂, Pico Turquino, Oriente Prov.; 10–29 June, 1936; 3750 ft.; J. A.

Genus **Melormenis** Metcalf

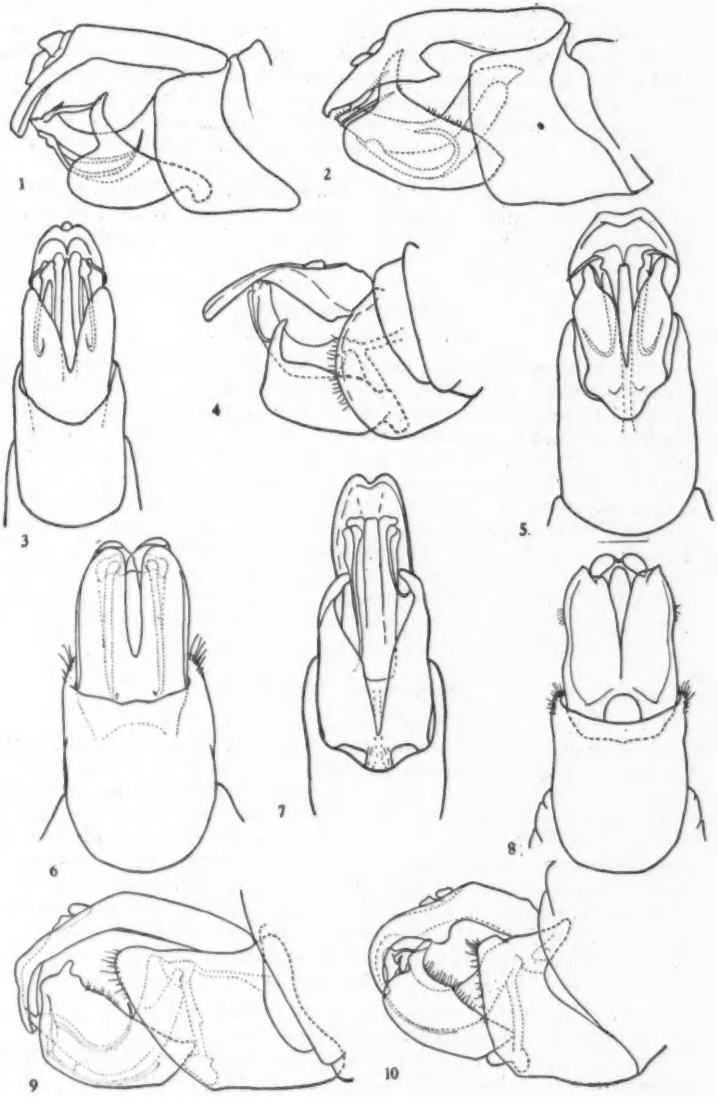
Melormenis Metcalf 1938a: 395. Nom. nov. for *Ormenis* Melichar nec *Ormenis* Stål.

Orthotype *Ormenis antillarum* Kirk. (*Cicada quadripunctata* Fabr.).

EXPLANATION OF PLATE XI

Lateral and Ventral Views of Male Genitalia

Fig. 1. *Cyarda fuscifrons* Metc. and Brun. Fig. 2. *Cyarda melichari* Van D. Fig. 3. *Cyarda fuscifrons* Metc. and Brun. Fig. 4. *Leocerus fuscus* Metc. and Brun. Fig. 5. *Cyarda melichari* Van D. Fig. 6. *Planodascalia viridicosta* Metc. and Brun. Fig. 7. *Leocerus fuscus* Metc. and Brun. Fig. 8. *Planodascalia fusca* Metc. and Brun. Fig. 9. *Planodascalia viridicosta* Metc. and Brun. Fig. 10. *Planodascalia fusca* Metc. and Brun.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This genus was proposed for those species of flatids closely related to *Cicada quadripunctata* Fabr. They may be characterized very briefly as follows: Crown very short, frons longer than broad, tegmina triangular; apical margin truncate, apical and sutural angles nearly equal, with a single subapical line rather remote from apical margin, nearly parallel and with most of the longitudinal veins forking beyond the subapical line; costal margin not as broad as costal cell at its widest point.

As thus constituted this genus would have a wide distribution in eastern North America through Mexico and the West Indies as far south as Argentina. It is the largest genus in the present collection, containing nine species.

Melormenis variegata n. sp.
(Pl. V, figs. 2, 5; Pl. XIII, fig. 6)

This is a medium-large species of *Melormenis* with the color chiefly blackish fuscous variegated with ochraceous buff. In structural characters it is very close to *Melormenis siboney*, but the genitalia are very distinct; genital plates short and broad, dorsal tooth distinctly removed from apical margin; aedeagus stout; apical spines short, stout, strongly curved; subapical spines short, stout, strongly curved, about same length as apical spines; anal segment slender and spatulate posterior to anal style, trough-shaped toward apex, lateral processes small, broadly rounded; median process wanting.

Holotype ♂: Pico Turquino, Oriente Prov.; 10–29 June, 1936; J. A. *Allotype* ♀: Naga, Oriente Prov.; 7 July, 1922; S. C. B. and C. H. B. *Paratypes:* 3 ♂♂, Sierra Maestra, Oriente Prov.; 7–20 July, 1922; C. H. B. and S. C. B. 4 ♂♂, Nagua, Oriente Prov.

Melormenis frigida n. sp.
(Pl. XII, figs. 6, 7)

This is one of the most strikingly colored of the species of *Melormenis* of Cuba. Typically the head, except compound eyes, and pronotum are yellowish green; tegmina are largely fuscous brown with claval suture, some large spots on the shoulder, and two large spots on costal margin yellowish green; costal spots frequently fade to whitish; compound eyes and mesonotum tawny; in some specimens, however, the fuscous areas of the wings are reduced to a broad triangle extending from apical margin to base with dorsal margin along the calval suture and ventral margin extending from about the middle of clavus to costal angle; legs and ventral areas usually ochraceous buff.

EXPLANATION OF PLATE XII
Lateral and Ventral Views of Male Genitalia

Fig. 1. *Melormenis pruinosa cubana* Metc. and Brun. Fig. 2. *Melormenis pruinosa cubana* Metc. and Brun. Fig. 3. *Ormenana punctata* Metc. and Brun. Fig. 4. *Melormenis pruinosa* Say. Fig. 4a. *Melormenis pruinosa* Say. Fig. 5. *Melormenis inconspicua* Metc. and Brun. Fig. 6. *Melormenis frigida* Metc. and Brun. Fig. 7. *Melormenis frigida* Metc. and Brun. Fig. 8. *Melormenis maestralis* Metc. and Brun. Fig. 9. *Melormenis asymmetrica* Metc. and Brun. Fig. 10. *Melormenis persea* Metc. and Brun. Fig. 11. *Melormenis persea* Metc. and Brun.

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Head including compound eyes not as wide as pronotum; face elongate; median carina very indistinct; mesonotum large; tegmina elongate.

Male genitalia with pygofer short and broad; genital plates short, broad, about one and one-half times as long as greatest width excluding elongate dorsal tooth; aedeagus broad, nearly straight; apical spines short, preapical spines nearly twice as long; subapical spines strongly curved basad; anal segment elongate; lateral angles inconspicuous.

Length to apex of tegmina: ♂, 8.40 mm.; ♀, 9.80 mm.

Holotype ♂: Sierra Maestra, Oriente Prov.; 10–20 July, 1922; 2800–3700 ft.; C. H. B. and S. C. B. *Allotype* ♀: Santiago de las Vegas, Habana Prov., on mango. *Paratypes:* 2 ♀ ♀, Santiago de las Vegas, Habana Prov.

Melormenis inconspicua n. sp.

(Pl. IV, figs. 9, 12; Pl. XII, fig. 5)

Typically this is a medium large species of *Melormenis* with the basal area of clavus and the apical area of tegmina blackish or blackish fuscous with a few smaller spots of blackish fuscous on basal area of corium; head and mesonotum chiefly tawny, pronotum and basal area of tegmina greenish; venter and legs chiefly tawny.

Crown short and broad; face about as broad as long, the lateral margins strongly elevated, and the dorsal margin with a distinct transverse elevated ridge; pronotum truncately projecting to anterior margin of compound eyes; median carina fairly distinct, a pair of deeply impressed points either side; mesonotum large, median and intermediate carinae distinct; tegmina narrow, elongate, the apical margin distinctly sinuate; apical angle somewhat produced.

Male genitalia with genital plates broad, elongate, with dorsal tooth near apex; aedeagus with apical spines short; preapical spines about twice as long as apical; subapical spines strongly recurved; a large basal projection; anal segment with ventral margin broadly triangularly produced; apical projection elongate, broadly flattened.

Length to apex of tegmina: 9.10 mm.

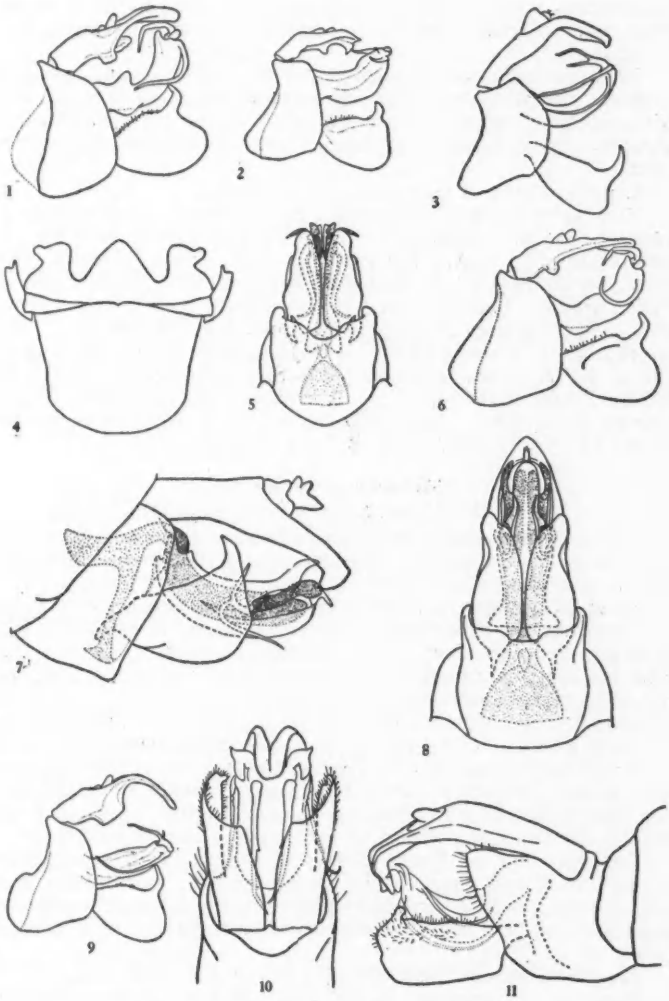
Holotype ♂: Pico Turquino, Oriente Prov.; 20 July, 1922; 5000–5500 ft.; S. C. B. and C. H. B. *Allotype* ♀: Loma del Gato, Sierra del Cobre, Oriente Prov.; 1–3 Oct., 1935; 2600–3325 ft.; J. A. and S. C. B. *Paratypes:* 1 ♂, Sierra Maestra, Oriente Prov., 10–20 July, 1922; 3000–4250 ft.; C. H. B. and S. C. B. 1 ♀, Sierra Maestra, Oriente Prov., 10–20 July, 1922; 3000–4250 ft.; C. H. B. and S. C. B.

Melormenis maestralis n. sp.

(Pl. XII, fig. 8)

This is a large blackish species with the head, pronotum, legs, and costal margin of tegmina light ochraceous buff. In general it resembles a dark *pruinosa* with costal margin more abruptly paler and distinct genitalia.

Crown very short, the produced pronotum reaching almost to anterior margin; face slightly longer than broad, the lateral margins strongly elevated; pronotum ecarinate, broadly incised posteriorly;



Male and Female Genitalia, as Indicated

Fig. 1. *Melormenis siboney* Metc. and Brun. ♂. Fig. 2. *Ormenana nana* Metc. and Brun. ♂. Fig. 3. *Cyarda haitensis* Metc. and Brun. ♂. Fig. 4. *Planodascalia aguayoi* Metc. and Brun. ♀. Fig. 5. *Melormenis asymmetrica* Metc. and Brun. ♂. Fig. 6. *Melormenis variegata* Metc. and Brun. ♂. Fig. 7. *Ormenaria rufifascia* Walk. ♂. Fig. 8. *Ormenaria rufifascia* Walk. ♂. Fig. 9. *Ormenana fusca* Metc. and Brun. ♂. Fig. 10. *Ormenis cubensis* Metc. and Brun. ♂. Fig. 11. *Ormenis cubensis* Metc. and Brun. ♂.

mesonotum with dorsal surface flattened and abruptly separated from lateral areas; tegmina elongate, the apical margin broadly rounded.

Male genitalia with genital plates short and broad, dorsal tooth elongate, somewhat acute, curving cephalad; aedeagus elongate, slender, with elongate apical spines; subapical spines elongate with apex abruptly curved dorsad; anal segment with an elongate slender ventral tooth.

Length to apex of tegmina: 7.000–8.50 mm.

Holotype ♂: Pico Turquino, Oriente Prov.; 10–29 June, 1936; 3750 ft.; J. A. *Allotype* ♀: Pico Turquino, Oriente Prov.; Oct., 1936; 3000 ft.; J. A. *Paratypes:* 2 ♂♂, Sierra Maestra, Oriente Prov.; 10–20 July, 1922; 3500–3800 ft.; S. C. B. and C. H. B. 1 ♂, Pico Turquino, Oriente Prov.; 20 July, 1922; S. C. B. and C. H. B. 2 ♂♂, Pico Turquino, Oriente Prov.; Oct., 1936; 3000 ft.; J. A. 3 ♀♀, Sierra Maestra, Oriente Prov.; 10–20 July, 1922; 1800–3300 ft.; S. C. B. and C. H. B. 1 ♀, Loma del Gato, Sierra del Cobre, Oriente Prov.; 1–2 Oct., 1935; 2600–3325 ft.; J. A. and S. C. B. 1 ♀, Pico Turquino, Oriente Prov.; Oct., 1936; 3000 ft.; J. A. 1 ♀, Jarahueca, Oriente Prov.; 14–18 July, 1927; S. C. B.

Melormenis persea n. sp.

(Pl. IV, figs. 7, 10; Pl. XII, figs. 10, 11)

This is a small species with a pale head and prothorax and fuscous mesonotum and tegmina. Tegmina are almost completely covered with a pale bluish pruinescence.

Head including eyes about as wide as pronotum; crown very short, face elongate, the whole surface reticulate; lateral margins only slightly elevated; pronotum short, anterior margin parabolic, projecting slightly cephalad of anterior margin of compound eyes; posterior margin almost rectangular; mesonotum large, the surface smooth, carina inconspicuous; tegmina elongate, narrow; subapical line inconspicuous and irregular.

Male genitalia with pygofer short and broad; genital plates about twice as long as greatest width, dorsal tooth elongate, slightly recurved with a basal projection; aedeagus elongate, slender, the apical spines less than half as long as preapical; subapical spines longer than apical, slightly curved; a midventral, elongate tooth directed caudad.

General color of head, pronotum, legs, and venter ochraceous brown; compound eyes chiefly reddish brown; mesonotum fuscous, lateral areas blackish fuscous; tegmina chiefly fuscous; inconspicuous black areas at base and at shoulders; costal margin usually indistinctly paler.

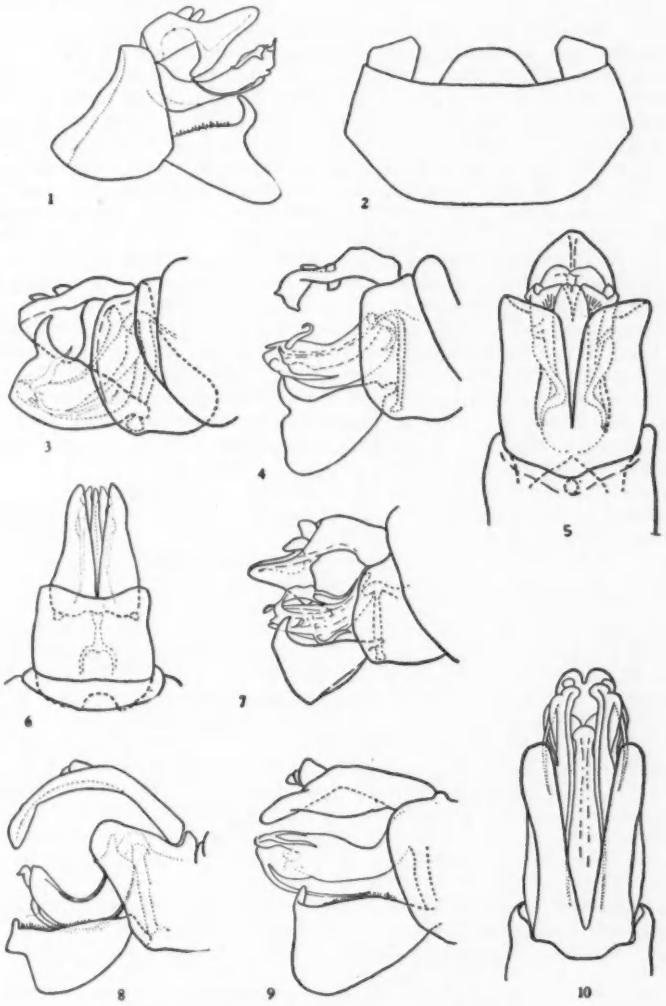
Length to apex of tegmina: ♂, 6.80 mm.; ♀, 8.40 mm.

Holotype ♂: Santiago de las Vegas, Habana Prov. *Allotype* ♀: Santiago de las Vegas, Habana Prov., on *Persea*; 18 July, 1928, S. C. B.

Melormenis asymmetrica n. sp.

(Pl. II, fig. 6; Pl. IV, figs. 8, 11; Pl. XII, fig. 9, Pl. XIII, fig. 5)

This is a moderate-sized to rather large species of *Melormenis* with the pronotum, head, and basal three-quarters of the tegmina light olive green; very distinct male genitalia.



Male and Female Genitalia, as Indicated

Fig. 1. *Ormenoides subflava* Metc. and Brun. ♂. Fig. 2. *Planodascalia obscura* Metc. and Brun. ♀. Fig. 3. *Byllisana brunnea* Metc. and Brun. ♂. Fig. 4. *Ormenana linki* Heid. and Osb. ♂. Fig. 5. *Dakshiana katharina* Metc. and Brun. ♂. Fig. 6. *Byllisana brunnea* Metc. and Brun. ♂. Fig. 7. *Dakshiana katharina* Metc. and Brun. ♂. Fig. 8. *Planodascalia obscura* Metc. and Brun. ♂. Fig. 9. *Carthaeomorpha balloui* Metc. and Brun. ♂. Fig. 10. *Carthaeomorpha balloui* Metc. and Brun. ♂.

Crown very short with a projecting pronotum reaching anterior margin; face elongate, the lateral margins strongly curved; median carina distinct, sometimes short; tegmina elongate with costal and sutural margins somewhat sinuate; apical and sutural angles strongly rounded; subapical line parallel to apical margin, about twice as far from apical margin as width of costal area; hind tibiae with two spines.

Male genitalia with pygofer short and broad; genital plates short and broad with a rather short, middorsal, recurved tooth; anal segment asymmetrical, short with a lateral lobe below on each side at about level of anal style, this lobe well developed and directed obliquely caudad on right and usually shorter and bent more or less cephalad on left side; aedeagus broad with a strong dorsal crest, a single pair of apical spines broad and flat towards center and a pair of elongate, moderately recurved, somewhat flattened subapical spines.

General color of head, pronotum, face, legs, venter of abdomen, and basal three-fourths of tegmina light olive green, more or less clouded with fuscous; eyes and mesonotum tawny; eyes clouded with fuscous on anterior margin, mesonotum clouded with fuscous on lateral margins; basal area of tegmina more or less clouded and spotted with fuscous, costal margin clouded with fuscous; apical area strongly clouded with fuscous, which may extend into center of corium.

Length to apex of tegmina: ♂, 6.50 mm.; ♀, 9.00 mm.

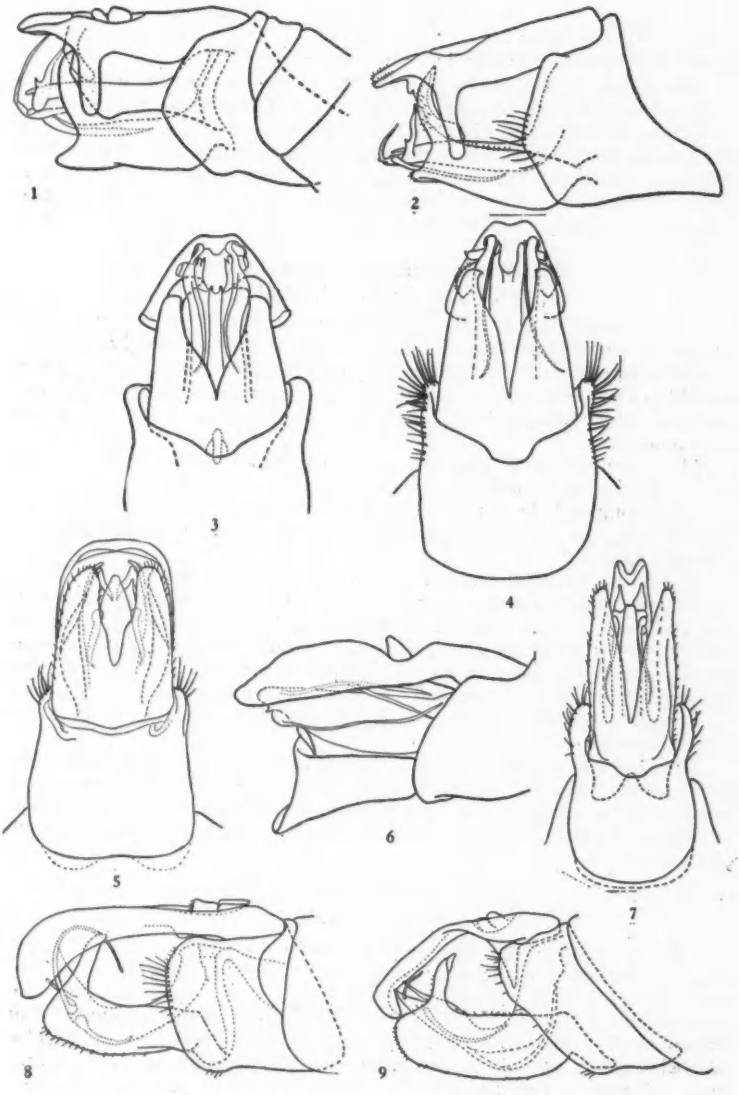
Holotype ♂: Santiago de las Vegas, Habana Prov., on *Pisonia aculeata* Linné; 28 July, 1932; A. R. O. *Allotype* ♀: Santiago de las Vegas, Habana Prov., on *Cordia colococca*, 3 Aug., 1932; S. C. B. *Paratypes:* 2 ♀ ♀, Santiago de las Vegas, Habana Prov.; S. C. B. 1 ♀, Colon, Matanzas Prov.; 15 Nov., 1922; A. C. 1 ♂, Isle of Pines; 4–12 Sept., 1926; S. C. B. and L. B. 1 ♀, Isle of Pines, 4–12 Sept., 1926; S. C. B. and L. B. 1 ♀, El Cano, Habana Prov.; 21 Sept., 1928; S. C. B. 1 ♂, El Fraile, Pinar del Rio Prov. 1 ♀, El Fraile, Pinar del Rio Prov. 1 ♂, Santiago de las Vegas, Habana Prov.; 16 July, 1920. 1 ♂, Barrio Caobilla, Camagüey Prov.; 23–25 June, 1927; J. A. 1 ♂, Vinales, Pinar del Rio Prov.; 15 Apr., 1930; S. C. B. 1 ♀, Santiago de las Vegas, Habana Prov.; 7 July, 1932; S. C. B. and A. R. O. 1 ♀, Jaronu, Camagüey Prov.; 3 Apr., 1932; L. C. S. 1 ♂, Wajay, Habana Prov., on *Casuarina*, 31 Aug., 1928; S. C. B. 2 ♀ ♀, Wajay, Habana Prov., on *Casuarina*, 31 Aug., 1928; S. C. B. 1 ♂, Cobre, Oriente Prov.; 5 Oct., 1928; F. S. and S. C. B. 1 ♀, Santiago de las Vegas, Habana Prov. 1 ♀, Oriente Prov.

Melormenis asymmetrica has been found on *Annona reticulata*, *Casuarina equisetifolia*, *Cedrela mexicana*, *Dichrostachys glomerata* (rather scarce), *Psidium guajaba*, and several other common plants.

EXPLANATION OF PLATE XV

Lateral and Ventral Views of Male Genitalia

Fig. 1. *Flatoidinus acutus* Uhl. Fig. 2. *Flatoidinus obscurus* Metc. and Brun. Fig. 3. *Flatoidinus acutus* Uhl. Fig. 4. *Flatoidinus obscurus* Metc. and Brun. Fig. 5. *Flatarissa humeralis* Metc. and Brun. Fig. 6. *Flatarina aguiari* Metc. and Brun. Fig. 7. *Flatidula pallescens* Metc. and Brun. Fig. 8. *Flatarissa humeralis* Metc. and Brun. Fig. 9. *Flatidula pallesceus* Metc. and Brun.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Melormenis pruinosa Say

(Pl. XII, figs. 4, 4a)

Flata pruinosa Say 1830a: 237.
Ormenis pruinosa Melichar 1902a: 71, Pl. V, fig. 7.

This is one of the most common species in eastern North America, ranging from Ontario to Florida, west to the Great Plain states, south to Texas, Arizona, and California to Mexico and Cuba. In Cuba it has a wide distribution, being recorded from all of the provinces where extensive collecting has been done. It is very variable in size and general coloration. The variation in coloration is due chiefly to the presence or absence of a bluish white pruinescence.

Melormenis pruinosa cubana n. subsp.

(Pl. IV, fig. 13; Pl. XII, figs. 1, 2)

Crown short and broad, covered for about half of its length by projecting pronotum; face elongate, lateral margins strongly arcuate; dorsal margin slightly longer than clypeal margin; median carina very variable, sometimes almost percurrent, at other times greatly reduced; tegmina with subapical line evident unless covered by the waxy pruinescence.

Male genitalia with pygofer short and broad; genital plates about twice as long as broad, an elongate, slightly recurved dorsal tooth; aedeagus long and slender with three pairs of spines; apical spines about half as long as preapical spines; subapical spines elongate, slender, strongly recurved.

Color very variable, due to a light bluish white pruinescence typically covering most of tegmina; color of head, pronotum, the center of thorax and abdomen including legs, light ochraceous buff; mesonotum, tegmina, and dorsum of abdomen chiefly fuscous; costal margin and claval suture usually distinctly paler with an indefinite paler area just beyond the discal cell; this pale area usually includes a round fuscous spot.

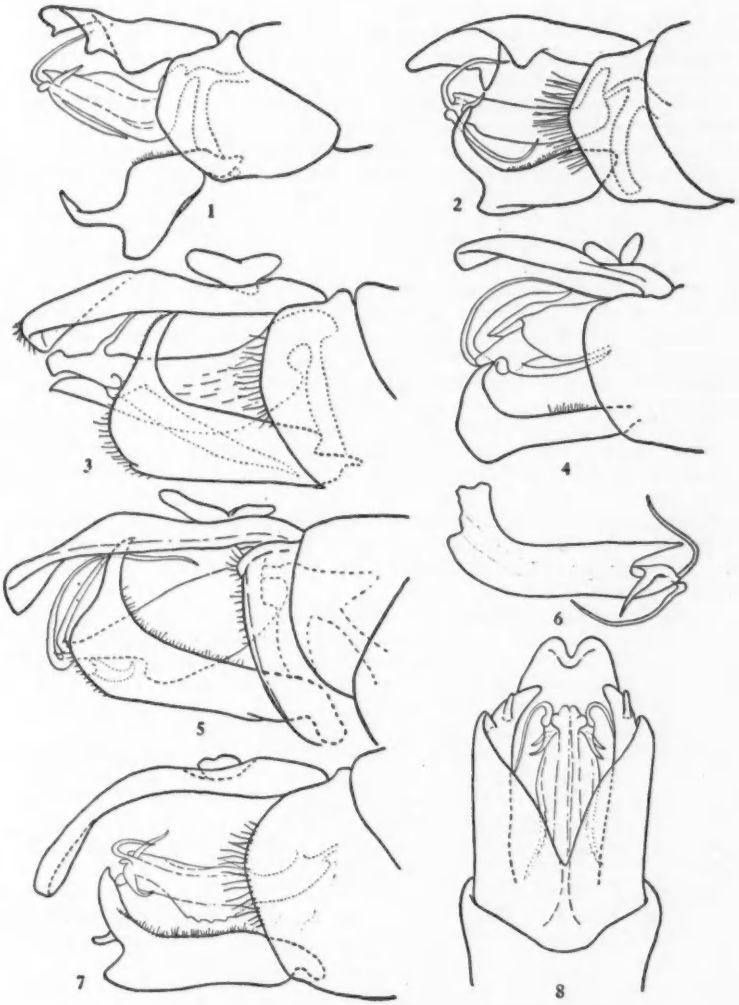
Length variable, smallest males to apex of tegmina, 5.00 mm.; largest females, 8.00 mm.

This subspecies seems to be widespread and abundant in Cuba, having been collected in practically all localities where extensive collecting has been done. We have examined specimens taken on *Annona reticulata*, *Coffea arabica*, *Coccolobis uvifera*, *Psidium guajava*, and other plants.

Melormenis siboney n. sp.

(Pl. XIII, fig. 1)

This is a rather large species of *Melormenis* with the tegmina chiefly blackish fuscous, variegated with light yellowish green. Typically there are two large semi-translucent spots on the costal margin, one near middle of costal area and one just before the apical line extending inward to near middle of corium; clavus and basal half of corium chiefly yellowish green with large irregular spots of blackish fuscous; lateral areas of mesonotum are chiefly blackish fuscous, the median area tawny fading to ochraceous tawny.



Lateral and Ventral Views of Male Genitalia

Fig. 1. *Flatoidinus dotatus* Mel. Fig. 2. *Flatoidinus olivaceus* Metc. and Brun. Fig. 3. *Pseudoflatoides lichenoides* Metc. and Brun. Fig. 4. *Pseudoflatoides tortrix* Guér.-Mén. Fig. 5. *Pseudoflatoides fasciculosus* Mel. Fig. 6. *Flatoidinus punctatus* Metc. and Brun. Fig. 7. *Flatoidinus pallescens* Metc. and Brun. Fig. 8. *Flatoidinus pallescens* Metc. and Brun.

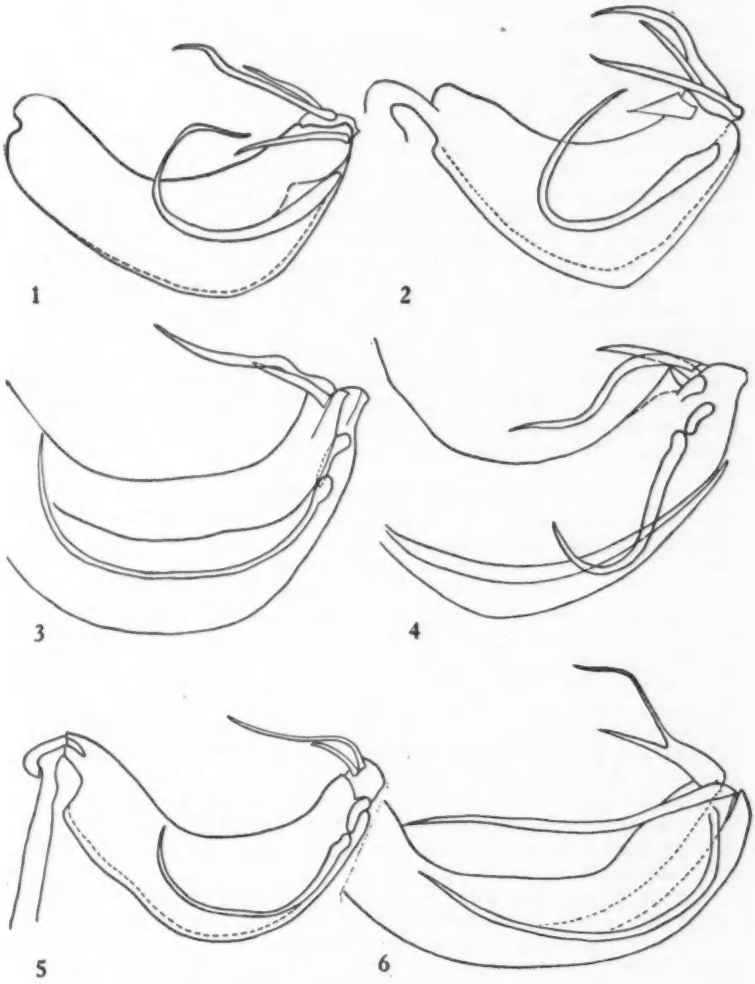
Crown very short, the anterior margin of pronotum extending almost to anterior margin of crown, leaving only the lateral areas exposed; face slightly broader than long, the lateral margins strongly elevated, the dorsal transverse carina evident; median carina evident dorsad; pronotum short and broad, the anterior margin strongly produced; lateral margins very short; posterior margin more broadly sinuate; mesonotum large, the intermediate carinae strongly elevated; tegmina typical, the subapical line evident; costal margins somewhat sinuate; most of longitudinal veins branched beyond subapical line.

Male genitalia with pygofer short and broad, the anal segment narrow, elongate with quadrate lateral processes and a distinct median process; genital plates nearly twice as long as broad, the apical margin broadly rounded, the dorsal tooth placed well before apex, elongate, slightly recurved; aedeagus elongate, nearly cylindric, with a dorsal projection on basal third; apical spines elongate, decurved; lateral processes sometimes asymmetrical, the one on the right side directed caudad and the one on the left side shorter, quadrate, directed ventrad; subapical spines longer than apical, distinctly curved.

Head, venter, and legs chiefly pale warm buff; compound eyes chiefly russet brown with a blackish mark dorsally; face somewhat clouded with pale fuscous; pronotum pale greenish yellow; mesonotum with central area chiefly ochraceous tawny, the lateral areas blackish fuscous, fading to ochraceous tawny, on tegulae; tegmina pale greenish yellow on basal half of corium and clavus, heavily spotted with fuscous, the apical area almost completely fuscous with exception of semi-translucent costal spots.

Length to apex of tegmina: 6.50–7.00 mm.

Holotype ♂: Loma del Gato, Sierra de Cobre, Oriente Prov.; 24–30 Sept., 1935; J. A., S. C. B. and L. C. S. *Allotype* ♀: Loma del Gato, Sierra de Cobre, Oriente Prov.; 24–30 Sept., 1935; J. A., S. C. B. and L. C. S. *Paratypes:* 2 ♀♀ and 1 ♂, Loma del Gato, Sierra de Cobre, Oriente Prov.; 1–2 Oct., 1935; 2600–3325 ft.; J. A. and S. C. B. 1 ♀, Camagüey, Camagüey Prov.; 22 July, 1923; J. A. 2 ♀♀, Camagüey, Camagüey Prov.; 30 July, 1923; J. A. 1 ♀, and 1 ♂, Nagua, Oriente Prov.; 7 July, 1922; C. H. B. and S. C. B. 7 ♀♀ and 1 ♂, Jaronu, Camagüey Prov.; 21 Aug., 1934; L. C. S. 2 ♂♂ and 1 ♀, Sierra Maestra, Oriente Prov.; 2000–2600 ft.; C. H. B. and S. C. B. 1 ♀, Buenos Aires, Trinidad Mts., Las Villas Prov. 1 ♀, Somorrostro, Habana Prov.; 16 Aug., 1936; L. C. S. 1 ♀, Puna, Camagüey Prov.; 15 Aug., 1932; L. C. S. 1 ♀, Jarahueca, Oriente Prov.; 14–18 July, 1927; S. C. B. 1 ♂, Pan de Matanzas Mts., Matanzas Prov.; 12 June, 1932; S. C. B., A. R. O. and L. C. S. 1 ♀, Oriente, Oriente Prov.; 12 Sept., 1934; L. C. S. 1 ♂, Sierra Rangel Mts., Pinar del Rio Prov.; 29 Aug., 1927; 1500 ft.; J. A. and S. C. B. 1 ♂, Pico Turquino, Oriente Prov., 10–29 June, 1936; 3750 ft.; J. A. 1 ♀, Guantánamo, Oriente Prov.; 28 Nov., 1931; L. C. S. 1 ♀, Las Animas, Pinar del Rio Prov.; 3–5 Sept., 1934; 1500 ft.; S. C. B. and A. R. O. 1 ♀, Nibuyon, Oriente Prov.; 1 Aug., 1935; J. N.



Lateral Views of Aedeagi of Genus *Cyarda*

Fig. 1. *Cyarda walkeri* Metc. Fig. 2. *Cyarda acuminipennis* Spin. Fig. 3. *Cyarda fuscifrons* Metc. and Brun. Fig. 4. *Cyarda cubensis* Metc. and Brun. Fig. 5. *Cyarda acutissima* Metc. and Brun. Fig. 6. *Cyarda haitensis* Metc. and Brun.

Genus **Cyarda** Walker

Cyarda Walker 1858b: 121. [Gen. n.]
Melichar 1902a: 133. [Described, key to species.]
Melichar 1923a: 91. [Described, catalogue of species.]
Metcalf 1923a: 151. [Key, key to species.]
Dozier 1928a: 119. [Described.]
Metcalf 1938a: 406. [Note.]

Haplotype *Cyarda difformis* Walk.

This is one of the most distinct genera of the family Flatidae. It may be readily recognized by the shape of the tegmina which are elongate, narrow, wider on the basal third and gradually constricted toward the apex. The apical margin is usually oblique and distinctly sinuate. This genus might be confused with the genus *Mistharnophantia* Kirk., but in that genus the tegmina are much shorter, being very little longer than broad, whereas in the genus *Cyarda* Walk. the tegmina are three or four times as long as broad.

Nine species are at present assigned to this genus. Three of these species are found in Africa and Madagascar and perhaps belong to some other genus. Six species are American and range from the southern U. S. through the West Indies to northern South America, including Venezuela and Dutch Guiana.

Cyarda acuminipennis Spinola

(Pl. III, figs. 1, 2; Pl. X, figs. 2, 5; Pl. XVII, fig. 2)

Cyarda acuminipennis Spinola 1839b: 445.
Melichar 1902a: 134; Pl. VII, fig. 12.
Metcalf 1923a: 151, Pl. 41, fig. 40; Pl. 48, fig. 139.

If we have correctly identified this species, it is the largest species of *Cyarda* from Cuba. The total length from apex of head to apex of abdomen is 7 to 8 mm., to apex of tegmina 10 to 12 mm. Melichar gives 10 mm. the total length of body and Spinola gives four lines as the length from apex of head to apex of abdomen. This species was originally described from Santo Domingo and has been recorded from Jamaica and is also found in southern Florida. It seems to be one of the most abundant species in Cuba. Specimens in our collection vary greatly in color from ochraceous tawny to ochraceous buff. In the ochraceous tawny specimens the apical half of tegmina, principal veins in basal half, and crossveins in costal margin are heavily clouded with blackish fuscous.

Crown broad, fully twice as broad as its median length; median carina very obtuse, frons about as broad as its median length, narrowed on clypeal margin and dorsal margin; pronotum broad, broadly extending cephalad to anterior margin of compound eyes; mesonotum quadrate; tegmina nearly four times as long as basal width; costal and sutural margins somewhat sinuate; apical margin broadly and shallowly sinuate; sutural and costal angles broadly rounded.

Male genitalia with the anal segment heavy; apical vertical portion broadened toward apex; genital plates somewhat elongate, dorsal tooth heavy, obtuse at apex; aedeagus elongate, somewhat slender; apical spines more than half as long as preapical; preapical spines very broad on basal third; apical two-thirds gradually acuminate, strongly

curved; subapical spines about as long as apical, straight and stouter; ventral spines elongate, U-shaped, the two limbs nearly equal in length.

Widely distributed in Cuba, having been collected from the principal areas where extensive collections have been made and occurring to 1500 feet in the Sierra Rangel Mountains.

Cyarda acutissima n. sp.

(Pl. III, fig. 3; Pl. X, figs. 1, 3; Pl. XVII, fig. 5)

This is a small *Cyarda* with tegmina very broad at base, much narrowed caudad, and produced into an acute apical area with apex rounded and apical margin fading indefinitely into sutural margin.

Vertex broad, about twice as broad as its median length; median carina broad, lateral margins broadly elevated; frons about as long as broad, lateral margins narrowly elevated; clypeal margin as broad as dorsal margin; pronotum short and broad, strongly projecting cephalad to middle of compound eyes; mesonotum quadrate, intermediate carinae usually strongly elevated; legs short and stout; tegmina broad at base, strongly narrowed beyond shoulders; apical area only about half as wide as basal area; costal margin strongly sinuate; apical area roundly acute; apical margin not sharply separated from commisural margin.

Male genitalia with anal segment elongate, slender; apical portion elongate, slender, almost at right angles to dorsal area; genital plates broad and short, dorsal tooth rather acute; aedeagus broad and stout, the apical spines about half as long as the preapical; preapical spines very slender; subapical spines short, stout, obtuse; ventral spines about one-half as long as aedeagus, broadly curved.

General color ochraceous tawny; brownish or blackish fuscous on crown, pronotum and mesonotum, in pustulate area of clavus and in apical area of tegmina; ten to twelve small round blackish spots in costal area and five or six in median area of tegmina.

Length to apex of tegmina: ♂, 6.50 mm.; ♀, 7.00 mm.

Holotype ♂: Herradura, Pinar del Rio Prov.; 20 Feb., 1932; S. C. B. and A. R. O. *Allotype* ♀: Herradura, Pinar del Rio Prov.; 20 Feb., 1932; S. C. B. and A. R. O. *Paratypes:* 2 ♂♂, Santa Fe, Isle of Pines; 8 May, 1933; A. R. O. 1 ♂, Taco Taco, Pinar del Rio Prov.; 6 Apr., 1922; S. C. B., J. A., and C. H. B. 1 ♀, Kingston, Jamaica; 15 Oct., 1923; C. H. B. 1 ♂, Santa Cruz de los Pinos, Pinar del Rio Prov.; 20 Feb., 1932; S. C. B. and A. R. O. 1 ♂ and 1 ♀, Playa de Marianao, Habana Prov.; 30 Jan., 1927; S. C. B.

Cyarda cubensis n. sp.

(Pl. III, fig. 4, 5; Pl. X, figs. 6, 8; Pl. XVII, fig. 4)

This is a rather small species of *Cyarda* with an elongate narrow crown and distinct male genitalia.

Crown but little broader than long; anterior margin rather obtuse; frons slightly longer than its greatest width, lateral margins strongly elevated; tegmina very broad at base, rather narrow in apical half; apical sinus distinct but not very deep.

Male genitalia with genital plates broad and short, dorsal tooth elongate, slender, acute; anal segment elongate, slender, the deflexed

portion almost as long as basal portion; aedeagus short, stout; apical spines about half as long as preapical, stout and gradually acuminate; preapical spines elongate, gradually acuminate, distinctly undulate; subapical spines very short, stout; ventral spines sickle-shaped, about as long as preapical, a strongly developed midventral process which is about as long as aedeagus.

General color light ochraceous buff, sometimes slightly clouded with tawny in central area of mesonotum; round black spots on tegmina, usually small; tegmina clouded with fuscous.

Length of apex of tegmina: ♂, 7.50 mm.; ♀, 8.00 mm.

Holotype ♂: Calabazar, Habana Prov.; 5 Aug., 1928; S. C. B. *Allotype* ♀: Cape Baragua, Camagüey Prov.; 26–27 June, 1927; S. C. B. and C. F. S. *Paratypes:* 3 ♂♂, Santiago de las Vegas, Habana Prov.; 2 ♀♀, Santiago de las Vegas, Habana Prov.; 1 ♀, Baragua, Camagüey Prov.

Cyarda fuscifrons n. sp.

(Pl. III, figs. 7, 8; Pl. XI, figs. 1, 3; Pl. XVII, fig. 3)

This is one of the smaller species of *Cyarda* with relatively short and broad tegmina and crown elongate but not protuberant. The male genitalia are distinct.

Crown about one and one-half times as broad as its median length; median carina not strongly elevated; lateral margins broadly elevated; frons elongate, longer than greatest width, lateral margins not strongly elevated; pronotum short and broad, nearly four times as broad as its median length; anterior margin projecting to about the middle of compound eyes, rather obtuse; median and intermediate carinae not strongly elevated; mesonotum relatively small, median carina indistinct, intermediate carinae not strongly elevated; tegmina short and broad, apical sinus deep, the costal and inner angles strongly rounded.

Male genitalia with the anal segment slender, elongate, the ventral projection short and slender; genital plates broad and short, dorsal tooth elongate, slightly recurved; aedeagus slender, the apical spines very short, less than one-half as long as preapical; preapical spines slender, the apices slightly undulate; subapical spines short, slender, triangular; ventral spines very elongate, approximately as long as aedeagus, broadly curved with the base bulbous.

General color light ochraceous brown; clypeus, the central areas of crown, pronotum, mesonotum tawny; tegmina light ochraceous buff with basal portion of costal area and apical area infuscated with scattered round black spots in costal and central areas; anterior margin of head blackish fuscous.

Length to apex of tegmina: ♂, 7.75 mm.; ♀, 8.00 mm.

Holotype ♂: Santiago de las Vegas, Habana Prov., on *Casuarina*, 29 May, 1934; S. C. B. *Allotype* ♀: Santiago de las Vegas, Habana Prov., on *Casuarina*, 29 May, 1934; S. C. B. *Paratypes:* 1 ♂, Camagüey, Camagüey Prov.; 23–25 June, 1927; J. A. 2 ♂♂, Santiago de las Vegas, Habana Prov. 1 ♂, Bahia de Cochinos, Las Villas Prov. 1 ♂, Cape San Antonio, Pinar del Rio Prov.; 13 Apr., 1924; S. C. B. 1 ♂, Playa de Marianao, Habana Prov.; 21 Aug., 1927; S. C. B.

Cyarda haitensis n. sp.

(Pl. XIII, fig. 3; Pl. XVII, fig. 6)

This is a rather large species of *Cyarda* with the crown broad and short. Tegmina broad at base, relatively short and broad at apex with apical sinus distinct. General color ochraceous buff with the apex of the head, the shoulder callosities, the principal veins on basal half of tegmina marked with blackish fuscous. The apical area of the tegmina chiefly fuscous. The crown, pronotum, and mesonotum ochraceous orange.

Male genitalia with pygofer short and broad; anal segment elongate, very slender, the deflexed portion about half as long as basal portion; genital plates about twice as long as broad, the apical tooth rather stout; aedeagus slender, the apical spines stout, bifurcate, the posterior process very slender, nearly twice as long as anterior process; preapical spines elongate, slender, almost as long as aedeagus; subapical spines almost as long as preapical, broadly curved.

Length to apex of tegmina: ♂, 9.50 mm.; ♀, 9.90 mm.

Holotype ♂: Port-au-Prince, Haiti, on *Acacia lutea*, 28 Feb., 1934; E. D. *Allotype* ♀: Port-au-Prince, Haiti, on *Acacia lutea*, 28 Feb., 1934; E. D. *Paratypes:* 3 ♂♂, Port-au-Prince, Haiti, on *Acacia lutea*, 28 Feb., 1934; E. D.

Cyarda melichari Van Duzee

(Pl. III, figs. 10, 11; Pl. XI, figs. 2, 5)

Cyarda melichari Van Duzee 1907a: 40. Nom. nov. for *Cyarda punctata* Melichar nec. *Flatoides punctata* Walker.

Cyarda melichari Metcalf 1923a: 151, Pl. 41, fig. 39; Pl. 48, figs. 136, 137. [Key, illustrated.]

Cyarda melichari Dozier 1928a: 120; fig. 28. [Described, illustrated.]

This is one of the smaller *Cyardas* with a narrow elongate crown and frons longer than its greatest width. This species has a wide distribution, having been recorded from the District of Columbia to Mississippi in the southeastern states and in Cuba and Jamaica.

Male genitalia with genital plates short and broad, dorsal tooth short; anal segment elongate, the vertical portion broadly expanded ventrad; apical spines short and broad, subequal; preapical spines elongate, slender, about half again as long as apical, and appears jointed near middle; subapical spines elongate, slender, not as long as preapical; ventral spines stout, strongly recurved, gradually narrowed to apical third, then broadened and acute at apex.

Specimens are at hand from Pinar del Rio and Habana Provinces and the Isle of Pines on beach grasses.

Cyarda walkeri Metcalf

(Pl. III, figs. 6, 9; Pl. X, figs. 4, 7; Pl. XVII, fig. 1)

Cyarda conformis Melichar 1902a: 134. Nec *Flatoides conformis* Walker 1851a: 412.

Cyarda walkeri Metcalf 1923a: 149, 151; Pl. 48, fig. 138. Nom. nov. for *Cyarda conformis* Melichar.

As we understand this species it is one of the smallest species of *Cyarda* with a short broad crown. Colors light ochraceous buff with tegmina with several small round dots. The male genitalia are distinct.

Crown short and broad, nearly three times as broad as its median length, broadly curved on anterior margin; frons about as long as greatest width between the eyes; tegmina relatively short and broad, apical sinus not deep; costal and inner angles not produced.

Male genitalia with the anal segment rather stout; apical vertical portion short and broad; anterior and posterior angles strongly produced; aedeagus stout with apical spines slender, nearly straight; preapical spines elongate, slender, about one-third longer than apical, undulate at apex; subapical spines about same length as preapical, slender, straight; ventral spines long and strongly recurved; genital plates short and rather broad, the dorsal tooth elongate, incurved.

Length to apex of tegmina: ♂, 7.75 mm.

Specimens are at hand from Pinar del Rio, Habana, Matanzas, and Santa Clara provinces.

Genus **Planodascalia** nov.

Orthotype *Planodascalia viridicosta* n. sp.

This genus belongs to that group of the Tribe Selizini which has the tegmina long and narrow, not especially narrowed posteriorly and with two subapical lines parallel to apical margin.

Crown short and broad; frons broader than long with a fairly distinct median carina and lateral margins strongly elevated; pronotum short and broad, but little longer than crown; anterior margin broadly curved, extending cephalad to about anterior margin of compound eyes; posterior margin broadly sinuate nearly parallel to anterior margin; mesonotum large; tegmina elongate, narrow; costal margin slightly sinuate; apical margin nearly straight; sutural angle produced; costal area slightly broader than costal cell; there are two distinct subapical lines; basal subapical line somewhat zigzag, most of longitudinal veins beyond last subapical line bifurcate; hind tibiae with two stout spines near apex.

Planodascalia fusca n. sp.

(Pl. IV, figs. 2, 5; Pl. XI, figs. 8, 10)

This species averages somewhat heavier than *viridicosta* with the body and tegmina chiefly blackish fuscous; costal margin narrowly bordered with pale ochraceous buff and the costal crossveins usually distinctly pale on blackish background.

Head and thorax about as in *viridicosta* with the lateral margins of the face less strongly reflexed; tegmina somewhat broader than in *viridicosta*; tubercles on clavus usually not conspicuous.

Male genitalia with genital plates elongate, about twice as long as greatest width; dorsal tooth elongate, obtuse, somewhat recurved; anal segment elongate with distinct lateral lobes; aedeagus elongate, curved; apical spines broad at base with a distinct tooth, apical portion slender, bent at almost right angles to base; preapical spines short, slender; subapical spines elongate, very slender.

General color blackish fuscous; head and pronotum tawny; eyes tawny, clouded with black; frons somewhat infuscated; tegmina usually blackish fuscous with costal margin narrowly pale.

Length to apex of tegmina: 6.75 mm.

Holotype ♂: Manacas, Las Villas Prov.; 7 June, 1930; S. C. B. *Allotype* ♀: Nagua, Oriente Prov.; 7 July, 1922; S. C. B. and C. H. B. *Paratypes:* 1 ♂, Cape San Antonio, Pinar del Rio Prov.; 13 Apr., 1924; S. C. B. 1 ♀, Guantánamo, Oriente Prov.; 28 Nov., 1931; L. C. S. 1 ♀, Playa Ocujal, Oriente Prov.; 30 July, 1935; J. A.

Planodascalia obscura n. sp.

(Pl. VI, figs. 8, 9; Pl. XIV, figs. 2, 8)

This is a variable species. As far as colorations is concerned superficially it has the same general color as *Bysillana brunnea* Metc. and Brun. The body, legs, and tegmina are ochraceous tawny or tawny with head and tegmina more or less clouded with fuscous or blackish; costal area greenish, fading to ochraceous; however, the tegmina are much longer than in *Bysillana brunnea*, and genitalia are entirely distinct.

Crown very short, not distinctly separated from frons; frons one and one-half times as broad as its median length; lateral margins strongly elevated, broadly curved; dorsal margin slightly longer than ventral margin; pronotum short and broad, anterior margin truncate between compound eyes; posterior margin triangularly incised; mesonotum large, dorsal area broadly flattened; tegmina elongate, narrow, the costal margin broadly sinuate, apical margin broadly truncate; apical and sutural angles subequal; costal membrane wider than costal cell with numerous crossveins; two subapical lines nearly parallel and about the same distance from each other as last subapical line is from apical margin; longitudinal veins mostly bifurcate beyond last subapical line; clavus and shoulders with numerous pustules.

Male genitalia with pygofer short and broad, nearly quadrate; genital plates elongate with a dorsal apical angle quadrately produced with a short obtuse tooth on dorsal angle; aedeagus slender, broadly curved with apical spines elongate, curved, almost as long as aedeagus following curve of aedeagus; subapical spines elongate, curved; anal segment elongate, longer than genital plates; anal spines short.

Length to apex of tegmina: 6.10–7.40 mm.

Holotype ♂: Isle of Pines; 27 June, 1939; A. R. O. *Allotype* ♀: Isle of Pines; 27 June, 1939; A. R. O.

Planodascalia viridicosta n. sp.

(Pl. II, figs. 4, 5; Pl. IV, figs. 1, 4; Pl. XI, figs. 6, 9)

This species is to be recognized by its somewhat smaller size, lighter colors, with the tegmina nearly uniform mummy brown, with the costal area and sometimes the humeri and claval suture light greenish.

Head broad, nearly as broad as mesonotum; crown short, anterior and posterior margins nearly parallel; frons short and broad, the lateral margins strongly elevated, the median carina fairly evident, nearly percurrent; tegmina elongate, narrow, the costal, apical and claval margins slightly sinuate; apical and sutural angles broadly rounded, apparently strongly produced.

Male genitalia with genital plates short and broad, dorsal tooth very short; anal segment elongate, slender, apical portion strongly decurved; aedeagus slender, curved; apex produced spine-like beyond

apical spines; apical spines elongate, sickle-shaped, slender; preapical spines short, attenuate; subapical spines longer than apical spines.

Head, venter, and legs almost completely light ochraceous orange, the tibiae and tarsi somewhat infuscated; clypeal margin of frons heavily infuscated, this mark sometimes continuing upward along lateral margins to dorsal margin of head; this color sometimes indicated on claval suture and very narrowly on basal subapical line; abdomen ventrad ochraceous tawny, sometimes tinged with green.

Length to apex of tegmina: 6.75 mm.

Holotype ♂: Loma del Gato, Sierra de Cobre, Oriente Prov.; 1–2 Oct., 1935; J. A. and S. C. B. *Allotype* ♀: Santo Thomas, Peninsula de Zapata, Santa Clara Prov.; 5–9 May, 1927; J. A. and S. C. B. *Paratypes:* 1 ♂, Santo Nicolás, Oriente Prov., on *Coffea arabica* Linn.; 20–21 July, 1927; S. C. B. 1 ♀, Camagüey, Camagüey Prov.; 24 Dec., 1921; J. A. 1 ♀, Las Animas, Sierra Rangel Mountains, Pinar del Rio Prov.; 3–5 Sept., 1934; 1500 ft.; S. C. B. and A. R. O. 1 ♀, Las Animas, Sierra Rangel Mountains, Pinar del Rio Prov.; May, 1933; 1500 ft.; S. C. B. and A. R. O.

Planodascalia aguayoi n. sp.

(Pl. XIII, fig. 4)

This is a rather large species of *Planodascalia* with the general color of the body and legs light ochraceous buff. The basal half of tegmina is chiefly ochraceous buff clouded with blackish fuscous on the shoulders and along the costal area. The apical half of tegmina is chiefly blackish fuscous.

The last ventral segment of the female is deeply notched in the median area with a strongly projecting, nearly rectangular tooth in the notch; lateral areas are broadly and somewhat quadrately produced with the posterior margin slightly sinuate and the lateral margins deeply sinuate with the outer posterior angles strongly produced.

Length to apex of tegmina: 7.25 mm.

Holotype ♀: El Yungue Mt., Oriental Prov.; 10 July, 1935; F. Z.

Genus **Flatarissa** nov.

Orthotype *Flatarissa humeralis* n. sp.

This genus resembles *Pseudoflatoides* in having the costal margin of tegmina undulate. Crown of head, however, is much shorter, not as long as its greatest width. In head characters it resembles the genus *Flatoidinus* somewhat, but the crown is composed in large part of the dorsal area of frons.

Crown impressed, separated into two distinct parts; vertex separated laterad from dorsal part of frons by a distinct carina, which fades out on median area; dorsal part of frons produced, distinctly bi-impressed on lateral margins; facial part of frons elongate, lateral margins slightly elevated, slightly arched; dorsal callosity evident; clypeus elongate; pronotum nearly twice as broad as head including compound eyes; central area broadly curved, mesonotum broad and flat, not as broad as pronotum; tegmina elongate, the costal and commisural margins nearly parallel; costal margin evidently undulate; apical margin broadly

curved truncate; costal area nearly two times as broad as costal cell; venation distinct; subcostal vein broadly undulate; a single distinct subapical line; hind tibiae with two spines on apical third.

Flatarissa humeralis n. sp.

(Pl. VI, figs. 10, 11; Pl. XV, figs. 5, 8)

This species is colored somewhat like *Flatoidinus acutus* variety *humeralis* Metc. and Brun.

Crown broader than long, face nearly twice as long as broad; dorsal margin broadly curved; lateral margins slightly widened to antennae and then nearly parallel to clypeus; pronotum twice as broad as median length, triangularly produced on anterior margin; posterior margin broadly incised; mesonotum broader than long.

Male genitalia with pygofer broader than long; genital plates elongate, slender; subapical tooth as long as greatest width of plates; aedeagus slender, somewhat curved; apical spines short, straight, projecting caudad; preapical spines elongate, slender, strongly recurved; subapical spines about one-half as long as preapical spines, slightly curved; anal segment elongate.

General color of head, compound eyes, pronotum and mesonotum and legs pale ochraceous tawny, heavily marked with blackish or blackish fuscous; there is a rather broad band of blackish fuscous across dorsal margin of frons and apical margin of crown; median line of pronotum narrowly fuscous; anterior margin of mesonotum is clouded with blackish fuscous; posterior lateral margins of mesonotum fuscous with two blackish dots at posterior angles of lateral compartments; basal areas of tegmina have a broad fuscous band extending from costal margin across clavus to first claval vein; this fascia is clouded with blackish along some of the veins; costal margin narrowly fuscous; apical margin dotted on veins with blackish fuscous; a cloud of blackish fuscous along sutural margin; before and behind claval suture with numerous irregular fuscous and blackish fuscous spots on tegmina.

Length to apex of tegmina: 11.50 mm.

Holotype ♂: Loma del Gato, Sierra de Cobre, Oriente Prov.; 24–30 Sept., 1935; 2600 ft.; J. A., S. C. B. and L. C. S.

Flatarissa variegata n. sp.

(Pl. I, fig. 4; Pl. VIII, figs. 1, 4; Pl. X, figs. 9, 10)

This species is chiefly olive green above, variegated with fuscous or blackish fuscous; venter, including face and legs, uniform ochraceous buff except blackish spines on hind tibiae and claws.

Head including eyes about half as broad as pronotum; crown including dorsal area of frons about twice as broad as long; frons nearly half again as long as its greatest width; median dorsal callosity evident; frons ecarinate; pronotum nearly four times as broad as its median length, bi-impressed; central area with lateral margins strongly carinate; lateral areas behind compound eyes strongly carinate on anterior margin; mesonotum narrower than pronotum, about as broad as median length, flat, ecarinate; costal area of tegmina broad with numerous narrowly spaced, nearly straight crossveins; subapical line about same

distance from apical margin as greatest width of costal cell; apical area of corium with numerous reticulate cells.

Male genitalia with pygofer short and broad; genital plates deeply incised caudad with a strongly developed tooth on dorsal margin; anal segment elongate, nearly as long as genital plates, much widened caudad, projecting ventrad as a strongly developed plate; aedeagus rather slender with a well-developed dorsal process projecting caudad beyond apex of aedeagus; apex of aedeagus with two pairs of spines, the apical spines straight, projecting cephalad, preapical spines more elongate, curved.

Length to apex of tegmina: 12.70 mm.

Holotype ♂: Pico Turquino, Oriente Prov.; 10–29 June, 1936; J. A.

Genus **Pseudoflatoides** Metcalf

Metcalf 1938a: 401.

Orthotype *Flata tortrix* Guérin Méneville.

This genus may be recognized by the following characteristics: Head including compound eyes narrower than pronotum, usually about half as broad; vertex longer than broad; obtusely triangularly produced on anterior margin; frons elongate, narrow, slightly widened below; lateral margins strongly elevated; dorsal median area produced into a distinct callosity; tegmina broad, horizontal; costal margin broadly undulate; venation distinct; costal area much broader than costal cell; apical area with two irregular subapical lines about equal distance from each other on apical margin; hind tibiae with two stout spines on apical third.

Pseudoflatoides fasciculosus Melichar

(Pl. VIII, figs. 7, 8; Pl. XVI, fig. 5)

Flatoides fasciculosus Melichar 1902a: 205; Pl. 9, fig. 7.

There are two specimens in the present collection which resemble Melichar's short description and illustration of this species. So far as we can determine *griseus* is only a color variety of this species, as the general structure characters and male genitalia seem to agree in essential details. In general coloration this species resembles *tortrix* but it differs in genital structures.

Crown not quite twice as long as width between eyes; face more than three times as long as greatest width, produced into a distinct callosity dorsad; pronotum short and broad, produced cephalad beyond midline of compound eyes; mesonotum not quite three times as long as pronotum; tegmina large; costal margin broadly undulate; subcostal vein prominent, undulate, apical area separated from basal area by a distinct transverse somewhat S-shaped line; reticulations in apical area fine, on basal area coarse.

Male genitalia with pygofer very short; genital plates with a long slender dorsal apical tooth; aedeagus short, stout; apical spines slender, broadly curved, as long as aedeagus; preapical spines slender, shorter than apical; subapical spines very short and broad; anal segment elongate, broad, covering genital plates and aedeagus.

Length to apex of tegmina: 15.00–18.00 mm.

Specimens are at hand from Camagüey, Camagüey Prov.; 15 Aug., 1924, and 26 July, 1923; J. A.

Pseudoflatoides fasciculosus var. **griseus** Melichar

(Pl. VIII, figs. 2, 5)

Flatoides griseus Melichar 1902a: 205.

This was described as a distinct species. We believe, however, that it is a pale variety of *fasciculosus*.

General color pale ochraceous buff with the frontal callosity very black; a large pair of fuscous spots on posterior lateral margins of mesonotum, a few small round black dots in costal area and a few irregular blotches and stripes fuscous or blackish fuscous on corium and clavus.

Length to apex of tegmina: 14.80 mm.

1 ♂, San Vicente, Pinar del Rio Prov.; 6–9 Apr., 1922; J. A. and S. C. B.

Pseudoflatoides fasciculosus var. **fasciatus** n. var.

This is a rather heavily marked variety of *fasciculosus*. The general structure and details of genitalia agree with the typical variety. It differs in the following color markings: There is usually a distinct transverse fascia on anterior margin of mesonotum; lateral margins of mesonotum may be completely black, or this color may break up into two or three pairs of large black spots; there is a distinct transverse blackish or blackish fuscous fascia extending from subcostal vein across corium to apex of clavus; beyond this are usually irregular markings of fuscous and black; costal area has the usual complement of small, round black dots.

Length to apex of tegmina: 14.00–16.00 mm.

Holotype ♂: San Vicente, Pinar del Rio Prov.; 6–9 Apr., 1922; S. C. B. and J. A. *Allotype* ♀: San Vicente, Pinar del Rio Prov.; 6–9 Apr., 1922; S. C. B. and J. A. *Paratypes:* 1 ♂, San Vicente, Pinar del Rio Prov.; 4–6 Sept., 1922; S. C. B. and J. A. 1 ♂ and 3 ♀♀♀, Camagüey, Camagüey Prov., 15 Aug., 1924; J. A. 1 ♀, Sierra Rangel Mts., Pinar del Rio Prov.; 29 Aug., 1927; 1500 ft.; J. A. and S. C. B. 1 ♀, Herradura, Pinar del Rio Prov.: 25 July, 1923; C. H. B. 1 ♀ Santo Tomas, Pinar del Rio Prov.; 19 Apr., 1935; J. A. and S. C. B.

Pseudoflatoides fasciculosus var. **vittatus** n. var.

(Pl. IX, figs. 2, 5)

In general structure and genitalia this species agrees with the typical *fasciculosus*. The color, however, is strikingly different.

General color above and beneath light ochraceous buff sometimes tinged with olive green and heavily marked with brownish fuscous; tegmina heavily covered with a whitish pruinescence, frontal callosity black; posterior lateral margins of mesonotum broadly bordered with black or this border broken up into three pairs of large blackish spots; tegmina with a broad blackish curving vitta extending from the humeral angle to apical angle and the narrow irregular fascia extending from subcostal vein to apex of clavus; on corium beyond apex of clavus an

irregular undulate brownish vitta; a few black dots and lines in costal area.

Length to apex of tegmina: 16.50 mm.

Holotype ♂: Camagüey, Camagüey Prov.; 20 Aug., 1924; J. A. *Allotype* ♀: Guantánamo, Oriente Prov.; S. C. B. *Paratypes:* 1 ♀, Camagüey, Camagüey Prov.; 15 Aug., 1924. 1 ♀, San Blas, Santa Clara Prov.; 15 Oct., 1931; G. C. R.

Pseudoflatoides fasciculosus var. **maculosus** n. var.

(Pl. I, fig. 1; Pl. VIII, figs. 3, 6)

Superficially this variety resembles *Flatoidinus acutus* var. *maculosus* Metc. in that the general color is light ochraceous buff and tegmina are heavily spotted and blotched with fuscous; pronotum with a single median blackish fuscous spot, and mesonotum heavily spotted with blackish fuscous; a single median spot on anterior margin and two pairs of spots on anterior lateral margins; posterior lateral margins with two large spots and a small spot; costal area with numerous large spots of blackish fuscous and corium with four large blotches of fuscous or blackish fuscous and a number of smaller spots; a distinct blackish fuscous stripe on basal margin of clavus, a number of small spots on commisural margin and a larger spot on apex of clavus; beneath including legs light ochraceous buff with lateral margins of abdomen blotched with blackish fuscous; frontal callosity brownish fuscous.

Length to apex of tegmina: 10.90 mm.

Holotype ♀: Santo Tomas, Peninsula de Zapata, Pinar del Rio Prov., on *Solanum* sp.; 5–9 May, 1927; S. C. B. and J. A.

Pseudoflatoides tortrix Guérin-Méneville

(Pl. IX, figs. 3, 6; Pl. XVI, fig. 4)

Guérin Méneville 1856a: 181; 1857a: 431.

There are at least two species in the present collection which would fit Guérin-Méneville's description of this species. We have decided, however, to give this name to one of the most abundant forms, which would fall within Guérin-Méneville's generalized description.

Crown short, broad, usually only about one-fifth longer than greatest width; anterior margin obtusely and triangularly produced.

Male genitalia with pygofer short and broad; genital plates slender, elongate, shorter than anal segment, apical dorsal tooth broad, elongate triangular; aedeagus short and broad with three pairs of spines; apical spines elongate, very slender; preapical spines shorter and broader; subapical spines about as long as preapical spines, slightly curved.

General color pale olive green with the head, thorax, legs, and ventral surface of abdomen tending to fade to olive tawny or tawny; there is a conspicuous black callosity at apex of head, two small round dots on basal third of mesonotum, and many irregular dots and dashes on tegmina. Other specimens are pale honey yellow or pale ochraceous buff in general color.

Length to apex of tegmina: 9.00–10.50 mm.

Pseudoflatoides tortrix var. **flavus** n. var.

This variety is identical in general structure and genitalia with the species *tortrix*. It differs, however, in general color and markings.

General color above ochraceous buff, lightly marked with blackish or brownish fuscous as follows: The lateral areas of pronotum behind compound eyes with two brownish fuscous vittae; mesonotum with a broad central blackish vitta; basal area of clavus, the corium behind the shoulders and costal area with blackish fuscous marks; small round black dots in costal area and apical cells; an indistinct brownish fascia in middle of corium and numerous irregular fuscous markings; beneath almost entirely ochraceous buff except the blackish callosity at apex of frons and spines and claws of the legs.

Holotype ♂: Camagüey, Camagüey Prov.; 20 Aug., 1924; J. A.

Pseudoflatoides tortrix var. **habanensis** n. var.

This variety is identical in general structure and male genitalia with the species *tortrix*. The color, however, is strikingly different.

General color light ochraceous buff, heavily marked with brownish fuscous and black; crown chiefly brownish fuscous with median line and lateral carinae and broad transverse fascia on anterior margin ochraceous buff; pronotum pale ochraceous buff; mesonotum brownish fuscous with intermediate carinae broadly black; tegmina ochraceous buff; costal area and costal cell brownish fuscous with small round black dots and dashes in costal area; apical area of clavus and apical area of corium behind subapical line brownish fuscous; there are two irregular black marks on basal area of corium; transverse fascia near middle of corium; a row of black spots in apical cells; irregular scattered blackish and fuscous dots over entire corium; frons with distinct blackish callosity.

Holotype ♂: Habana, Habana Prov.; 15 Dec., 1941; R. G. C.

Pseudoflatoides tortrix var. **insularis** Melichar

(Pl. VIII, figs. 9, 10)

Flatoides insularis Melichar 1902a: 209; Pl. IX, fig. 10.

If we have correctly identified this form, it is merely a color variety of *Pseudoflatoides tortrix*, as it cannot be distinguished by general structure or genitalia from that species. In general color it resembles *Pseudoflatoides fasciculosus* var. *vittatus* Metc. and Brun. but structurally it belongs to *tortrix*.

General color above and beneath light ochraceous buff; frontal callosity brownish fuscous; a broad black vitta across the lateral margins of pronotum behind compound eyes; mesonotum heavily marked with brownish fuscous; a broad curving vitta across tegmina from humeral angle to apical angle; costal area marked with a few small brown fuscous spots and a few fuscous dashes; apical area of tegmina marked with light fuscous brown; front tibiae and tarsi marked with brownish fuscous.

Length to apex of tegmina: 8.50 mm.

♂: Santiago de las Vegas; C. H. B.

Pseudoflatoides lichenoides n. sp.

(Pl. I, fig. 2; Pl. IX, figs. 1, 4; Pl. XVI, fig. 3)

This is one of the most conspicuously marked species in this genus.

Crown short and broad; pronotum short, the central area triangularly produced; mesonotum small; tegmina broad, conspicuously undulate.

Male genitalia with pygofer short; genital plates elongate, slender, apical dorsal tooth elongate; aedeagus stout; preapical spines elongate, slender; subapical spines broad, acuminate, nearly as long as aedeagus; tenth segment elongate, longer than genital plates.

General color of crown, pronotum, and mesonotum ochraceous tawny; crown with a pair of brownish vittae on lateral margins; pronotum with a distinct blackish fuscous fascia in lateral areas; mesonotum with a blackish fascia near anterior margin; posterior lateral margins marked with a pair of large black marks and behind these are small round black spots; tegmina principally pale ochraceous buff with a broad ochraceous tawny saddle extending from costal margin to sutural margin; in the center of this saddle is a narrow blackish fascia extending from subcostal vein to sutural margin; veins in this area are rugulose and marked with blackish fuscous; the sutural margin heavily marked with blackish; apical area with an irregularly curved fascia extending from subcostal vein around apex of tegmina to apex of clavus and costal margin in undulated areas heavily marked with brownish fuscous; a row of small black spots in apical cells extending from apical angle to sutural angle; beneath chiefly ochraceous buff; frons irrorate with brownish; frontal callosity blackish; front and middle legs with femur and tibiae more or less irrorate with brownish fuscous.

Length to apex of tegmina: 10.20 mm.

Holotype ♂: Pico Turquino, Oriente Prov.; 10–29 June, 1936; 1650 ft.; J. A.

Genus **Flatidula** nov.

Orthotype *Flatidula luella* n. sp.

This genus resembles *Flatoidinus* Mel. in having crown broader than long. Otherwise, however, it differs materially from this genus.

Crown broad, the lateral margins longer than median line, nearly parallel; frons elongate, dorsal margin triangularly incised; head much narrower than pronotum; pronotum broad, the central area broadly produced, extending in front of compound eyes; mesonotum large; tegmina elongate, narrow; costal margin slightly sinuate; costal area broad, reticulately veined; venation of tegmina indistinct; hind tibiae with two spines on apical third, placed close together.

Flatidula luella n. sp.

(Pl. II, fig. 2; Pl. IX, figs. 7, 8, 9)

Crown about four times as broad as its median length; lateral margins nearly twice as long as median length, carinate, nearly straight; anterior margin strongly produced on median third; frons about twice as long as its greatest width, dorsal margin triangularly incised and lateral margins strongly elevated, somewhat broadly curved to level of antennae and then narrowed to clypeus; median carina distinct to level of lower margin of compound eyes; pronotum nearly twice as broad as head including compound eyes; anterior margin obtusely triangularly produced in front of anterior margin of compound eyes; central area strongly depressed; mesonotum large, the anterior central area strongly elevated; venation of tegmina indistinct, the apical half with numerous indistinct irregular, reticulate cells; no subapical line;

costal area nearly four times as broad as costal cell with numerous irregular rather indistinct reticulate veins and crossveins.

General color brownish olive tinged with honey yellow, especially on mesonotum, venter, and legs, strongly marked and spotted with blackish; crown with anterior margin blackish forming two fairly distinct spots on either side of median line; pronotum and mesonotum with a broad blackish median vitta from anterior to posterior margins; pronotum with a few spots in lateral areas; mesonotum with several blackish dots; frons with a pair of blackish dots on dorsal margin and at least two pairs of smaller dots; median carina marked with blackish; rest of frons irregularly marked with blackish; compound eyes brownish, spotted with fuscous; lateral areas heavily marked with black; tegmina with costal area irregularly marked with black; corium with a broad cloud of irregular blackish markings along claval suture and a broad curved fascia from sutural angle to costal angle; clavus clouded with irregular blackish fuscous.

Length to apex of tegmina: 13.00 mm.

Holotype ♀: Camagüey, Camagüey Prov., on *Andira jamaicensis*, 15 July, 1922; J. A.

Flatidula pallescens n. sp.

(Pl. I, fig. 3; Pl. XV, figs. 7, 9)

This is a pale ochraceous greenish species heavily marked with light fuscous.

Crown short and broad, about three times as broad as median length; anterior margin nearly straight; pronotum with central area nearly quadrate, anterior margin broadly curved; posterior margin triangularly incised; mesonotum large with a distinct callosity on median line anteriorly; tegmina long and narrow; costal margin and subcostal vein straight; subapical line irregular; frons nearly one and one-half times as long as broad; dorsal margin deeply triangularly incised; lateral margins strongly elevated; median carina distinct on dorsal half.

Male genitalia with pygofer short; genital plates nearly quadrate, about two and one-half times as long as broad when viewed laterally; preapical dorsal tooth elongate, straight, acuminate; aedeagus elongate, strongly curved; apical spines short and slender; preapical spines about four times as long as apical spines, broadly curved; subapical spines nearly as long as aedeagus, broadly curved; median process slender, acuminate, directed caudad; anal segment relatively slender, apical portion elongate, strongly deflexed.

General color ochraceous tawny with a greenish tinge marked with fuscous as follows: A slender median vitta on pronotum which is continued on mesonotum, widening and bifurcate behind mesonotal callosity; two narrow vittae on preocular area; frons with broad dorsal fascia and a more indefinite ventral fascia; tegmina with several large round fuscous marks in costal area especially along costal margin; numerous irregular blotches on corium, these blotches forming a curved vitta extending from subcostal vein to apical angle; most of apical cells with small round fuscous marks; beneath and legs chiefly pale ochraceous buff.

Length to apex of tegmina: 10.90 mm.

Holotype ♂: San Blas, Trinidad Mts., Las Villas Prov.; 3 May, 1932; S. C. B. and A. R. O.

Genus **Flatarina** nov.

Orthotype *Flatarina aguiari* n. sp.

Crown broader than long, distinctly ecarinate, separated from frons by a broadly curved carina; lateral margins distinctly carinate, broadly curved; frons longer than broad, indistinct median and intermediate carinae on dorsal area; clypeus ecarinate; pronotum short and broad, much broader than head including the compound eyes; lateral margins with a distinct tooth behind compound eyes; mesonotum short and broad; tegmina broad basad, narrowed caudad; costal margin distinctly sinuate toward apex; costal area very broad; venation very irregular; apical margin slightly produced caudad; two irregular subapical lines; hind tibiae with two long spines.

Flatarina aguiari n. sp.

(Pl. VI, fig. 12; Pl. XV, fig. 6)

This ia a pale greenish yellow species with tawny compound eyes; mesonotum pale tawny; base of corium and clavus greenish fuscous, a few irregular dots of fuscous at apex of clavus; costal and apical margins of tegmina fuscous with the sutural margin of tegmina beyond clavus with small fuscous spots in the cells and larger fuscous spots just inside the penultimate subapical line; venter and legs pale ochraceous buff.

Male genitalia with pygofer elongate, broad; genital plates elongate, narrow, not as long as anal segment; subapical tooth triangular and twisted, ventral apical angles produced; aedeagus stout with apical, preapical, and subapical spines elongate, slender, subequal; anal segment elongate.

Length to apex of tegmina: 10.00 mm.

Holotype ♂: Buenos Aires, Trinidad Mts., Santa Clara Prov.; 4 May, 1932; 2350–2800 ft.; S. C. B. and A. R. O.

Named in honor of Mr. Cecilio Aguiar, inspector of the *Seccion de Sanidad Vegetal*, Ministry of Agriculture, Habana.

Genus **Flatoidinus** Melichar

Flatoidinus Melichar 1923a: 117.

Orthotype *Poekilloptera convivus* Stål.

In this genus the crown is broader than long triangularly produced, but the head is narrower than pronotum; pronotum about as long as crown with mesonotum broader than long; frons elongate; tegmina elongate; costal margin about twice as broad as costal cell; two irregular subapical lines, the second short; hind tibiae with two spines.

The species in this genus are very variable in color and there seems to be very little intergradation between the different color varieties. This has led to description of a number of different species which we now consider as mere color varieties. The genitalia seem to be distinctive and are described in some detail.

Flatoidinus obscurus n. sp.

(Pl. XV, figs. 2, 4)

This species is close to *acutus* Uhl. but for the present, at least, we shall keep it separate, based upon slight differences in the male genitalia. There are very few structural characters or color markings that could be used to distinguish this species from *acutus*.

Male genitalia with pygofer more elongate than in *acutus;* genital plates shorter than in *acutus* and with the dorsal tooth more slender and elongate; aedeagus distinctly longer and more slender than in *acutus;* apical spines only about half as long as preapical spines; preapical spines with a distinct tooth on caudal margin near base; subapical spines more slender and elongate than in *acutus;* anal segment much more elongate and slender, lateral processes more elongate and narrower; median process elongate, recurved with a distinct tooth on basal area; apex distinctly widened.

General color above ochraceous brown with crown and pronotum tawny; tegmina more or less clouded along principal veins with fuscous, especially in the area of corium beyond subapical line; general color beneath ochraceous buff with frons ochraceous tawny, clouded with blackish fuscous on dorsal margin; compound eyes blackish fuscous.

Length to apex of tegmina: 8.60 mm.

Holotype ♂: Cayamas, Oriente Prov.; E. A. S.

Flatoidinus acutus Uhler

(Pl. II, fig. 1; Pl. VII, figs. 5, 8; Pl. XV, figs. 1, 3)

Dascalia acuta Uhler 1901a: 514.

This is one of the most widely distributed species of flatids, ranging from Georgia and Florida across the West Indies to Puerto Rico. In Cuba it is widely distributed, ranging from Oriente Province on the west to Habana Province and the Isle of Pines. This is also a very variable species in size and color. The smaller specimens are about eight millimeters in length to the apex of the tegmina, and the larger specimens are nearly fifteen millimeters in total length. In general color the species ranges from pale olive green or light ochraceous buff to deep cinnamon brown. In markings this species varies from almost unspotted specimens with a few small dots in the costal area to forms that are heavily blotched with blackish. This species has no less than four distinct color varieties. We can, however, associate no difference in the genitalia in these four varieties.

Male genitalia with pygofer short and broad; genital plates elongate with a very long dorsal tooth on apical third; aedeagus longer than genital plates; apical spines elongate, slender; preapical spines shorter than apical spines with a triangular tooth on basal third; subapical spines elongate, rather stout; anal segment elongate, the pair of lateral processes not very long, rather broad; median process short, broad, slightly recurved.

We are indebted to Paul W. Oman for dissecting one of the types of *acutus* and sending us a sketch of aedeagus.

Flatoidinus acutus var. **bipunctatus** n. var.

This is a very distinct color variety of *acutus*. The general color is pale ochraceous buff with a pair of large oval blackish spots covering most of the central area of clavus and adjoining area of corium; the costal area has several small black points, and the corium is also spotted irregularly with black between apex of clavus and subapical line; a row of blackish fuscous spots on apical margin; the subapical line is narrowly clouded with fuscous as are the lateral areas of mesonotum.

Length to apex of tegmina: 10.60 mm.

Holotype ♂: Santiago de las Vegas, Habana Prov.; 14 March, 1931; A. R. O. *Allotype* ♀: Santiago de las Vegas, Habana Prov., on *Guánabana;* 8 Aug., 1941; S. C. B. *Paratypes:* 1 ♀, Santiago de las Vegas, Habana Prov.; 17 Aug., 1935; L. C. S. 1 ♀, Habana, Habana Prov., on *Jassimum grandiflora;* 9 March, 1922, C. H. B.

Flatoidinus acutus var. **maculosus** Metcalf

Flatoides maculosus Metcalf 1923a: 191; Pl. 39, fig. 17; Pl. 48, fig. 145.

This is another very distinct color variety of *acutus* with mesonotum usually tawny. The general color above and below is warm ochraceous buff with the tegmina heavily blotched with fuscous over the entire surface.

This species was described from a female from Paradise Keys, Florida, and a male from Marco, Florida. Since that we have received another male from Marco, Florida, and there are two females in the present collection from Cojímar, Habana Prov.; 29 July, 1934; S. C. B.

Flatoidinus acutus var. **humeralis** n. var.

This is a very distinct color variety of *acutus*. Color above and beneath warm buff with a pair of large irregular fascia across the basal areas of the corium and about halfway across the clavus, blackish fuscous; irregular spots and blotches in costal and apical areas of corium with a few irregular larger blotches on corium; two small blotches in lateral areas of mesonotum.

Holotype ♀: Ecano, Habana Prov., on *Casearia hirsuta;* 8 Feb., 1932; L. C. S. *Paratypes:* I ♀, Cuba.

Flatoidinus punctatus Walker

(Pl. XVI, fig. 6)

Elidiptera punctata Walker 1851a: 332.

This species is apparently very close to *Flatoides acutus*. If we have identified it correctly and our identification has been verified by Mr. China from the mutilated type specimen in the British Museum it is a species with a short, obtuse crown, the anterior margin of pronotum broadly rounded, and the genitalia very distinct. This species has been recorded from Cuba. We have, however, no specimens in the present collection. We do have specimens from Florida and Haiti which seem to be typical, and Dr. Oman advises me that the typical series of *acutus* in the National Museum contains specimens which are what we would describe as *punctatus*.

Male genitalia with genital plates and tenth segment about as in *acutus;* aedeagus long and slender; apical spines slender, recurved; preapical spines stout, shorter than apical spines, without marginal tooth; subapical spines elongate, slender, slightly curved.

Flatoidinus dotatus Melichar

(Pl. VII, figs. 6, 9; Pl. XVI, fig. 1)

Flatoides dotatus Melichar 1902a: 222; Pl. 8, fig. 12.

There is a single specimen in our collection which agrees in essential detail with Melichar's description. The crown is not very strongly produced; lateral angles not prominent; pronotum short, rounded on anterior margin, not projecting as in other species. In color our specimen differs decidedly from Melichar's description. Our specimen is almost entirely ochraceous buff, brown above and beneath, but the distribution of the black color markings are similar to the description by Melichar.

Male genitalia are quite similar to *obscurus* and *acutus;* genital plates are broader than in these species with a distinct elongate tooth on dorsal margin; aedeagus somewhat longer than genital plates; apical spines elongate, slender; preapical spines about half as long as apical spines, stouter; subapical spines longer than apical, stouter; apex very acute; anal segment elongate, slender; lateral processes broadly triangular with apex obtuse; no median process.

1 ♂: Isle of Pines; 4–12 Sept., 1928; S. C. B. and L. B.

Flatoidinus olivaceus n. sp.

(Pl. II, fig. 3; Pl. VII, figs. 1, 3; Pl. XVI, fig. 2)

This is a pale olive yellow species with mesonotum tawny and a few small blackish points and fuscous markings on head, pronotum, mesonotum, and tegmina. In general color this species resembles a smaller pale specimen of *acutus*. The genitalia, however, are entirely different.

Male genitalia with genital plates elongate, narrow, dorsal tooth elongate, acuminate; aedeagus straight and stout, shorter than genital plates; apical spines elongate, slender, broadly curved; preapical spines broad, short, about one-third as long as apical; subapical spines elongate, slender, slightly curved, longer than apical, anal segment elongate, narrow, the lateral processes short, obtuse; median process elongate, triangular.

Length to apex of tegmina: 10.50 mm.

Holotype ♂: Nagua, Oriente Prov.; 7 July, 1922; S. C. B. and C. H. B. *Allotype* ♀: Santiago de las Vegas, Habana Prov.; S. C. B. *Paratypes:* 1 ♂, Camagüey, Camagüey Prov.; 15 Aug., 1924; J. A. 1 ♀, Santiago de las Vegas, Habana Prov.; 17 Aug., 1935; L. C. S. 1 ♀, Santiago de las Vegas, Habana Prov.; 29 June, 1932; A. R. O.

Flatoidinus pallescens n. sp.

(Pl. VII, figs. 7, 10; Pl. XVI, figs. 7, 8)

This is a light buff colored species averaging somewhat larger than *acutus* and with distinct genitalia. Crown short, somewhat acute;

pronotum broadly rounded on anterior and posterior margins; tegmina elongate, narrow.

Male genitalia with pygofer elongate; lateral margins produced; genital plates elongate, slender, dorsal apical tooth with a distinct basal caudal process; aedeagus elongate, slender; apical spines short, nearly straight; preapical spines strongly recurved; subapical spines short, somewhat recurved; anal segment elongate, narrow, longer than genital plates.

General color light buff; mesonotum ochraceous tawny; dark markings very irregular; there are usually two pairs of blackish dashes on lateral margins of mesonotum and usually several small black punctures in costal area and a row of small points in apical cells.

Length to apex of tegmina: 10.50–11.00 mm.

Holotype ♂: Buenos Aires, Trinidad Mts., Santa Clara Prov.; 4 May, 1932; 2350–2800 ft.; S. C. B. and A. R. O. *Allotype* ♀: Nagua, Oriente Prov., on *lonchocarpus* sp.; 7 July, 1922; S. C. B. and C. H. B. *Paratypes:* 1 ♀, Jarahueca, Oriente Prov., on *Coffea arabica* Linn.; 14–18 July, 1927; S. C. B. 1 ♀, Wajay, Habana Prov., on *Casuarina;* 22 Aug., 1928; S. C. B.

Flatoidinus lugubris n. sp.

This is the largest and darkest colored species of *Flatoidinus* known to us from Cuba.

Crown tawny, the anterior margin blackish; face, legs, and venter ochraceous tawny; dorsal margin of face blackish and two blackish dashes in preocular region; eyes blackish fuscous; pronotum tawny with a greenish tinge; mesonotum dark tawny, anterior margin fuscous and two distinct black spots on posterior lateral margin; anterior two-thirds of tegmina olive green; posterior third blackish fuscous.

Length to apex of tegmina: 12.75 mm.

Holotype ♀: Topes de Collantes, Trinidad Mts., Las Villas Prov.; 10–15 Sept., 1941; A. R. O. *Paratypes*: 1 ♀, Topes de Collantes, Trinidad Mts., Las Villas Prov.; 10–15 Sept., 1941; A. R. O.

NEW NORTH AMERICAN BEES OF THE GENUS DUFOUREA

(Hymenoptera: Halictidae)

PART II

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This is the second of a series of papers describing new *Dufourea*. Subsequent papers will comprise a revision of the North American species which will include illustrations of the bees described in the present series.

As stated in the previous paper, holotypes and allotypes will be deposited in the California Academy of Sciences and paratypes will be placed in the following collections, besides the author's: U. S. National Museum; University of California Citrus Experiment Station, Riverside; American Museum of Natural History, New York. Additional paratypes, when available, will be furnished to other collections upon request.

Dufourea cuprea n. sp.

Male.—Length about 7 mm., length of anterior wing 5.2 mm.; pubescence largely pale, considerable dark hair on head; integument very dark with dark blue, bronze reflections; body moderately elongate. *Head:* Face slightly over four-fifths as long as broad; eyes with inner margins nearly parallel, converging slightly at the bottom, their length about five-sevenths the distance between them at antennal insertion; face, viewed directly from in front, with distance between lateral ocelli slightly more than twice that from one to posterior vertex margin; distance from antennal socket to clypeus nearly as great as socket diameter; clypeus short, with long, white, reclining pubescence, basal fringe composed of more erect black hairs, the whole not completely concealing integument; supra-clypeal area with prostrate, sparse, white hair medially, long, erect, black hair on lateral margin; hair between antennal sockets, on frons, scape long, dark grey to blackish; frons coarsely, unevenly punctured, very sparsely so in small areas just anterior to median and laterad to posterior ocellus but more dense along inner eye margins where punctures average about or less than one puncture width apart; area laterad to posterior ocellus slightly depressed; antennae of moderate length, not reaching beyond tegulae; scape over twice as long as broad; flagellum black, slightly clavate, glabrous except for usual, uniform, microscopic pubescence, segments mostly about as long as broad, entirely roughened, second no longer than first or third, first about two-thirds as broad as last; maxilla with stipes shorter than hind tibia, no longer than eye; galea three times as long as broad, two-thirds as long as stipes, pointed apically; maxillary palpus a little over half as long as stipes, first segment nearly half as broad as long, about as long as second, as long as third, fourth, sixth combined; sixth one-third its length longer than third or fourth, three times as

long as fifth which is as broad as long; labial palpus as long as first two maxillary palpal segments together, first segment five times as long as broad, longer than next three together, a little longer than first maxillary, last segment two-thirds the second, three times the third which is as broad as long. *Thorax:* Mesoscutum unevenly punctured, closely, rather finely so anteriorly where punctures average less than one puncture width apart, coarsely, a little more separately on posterior two-thirds and on mesoscutellum where punctures average about or less than one width apart; mesonotal surface rather sparsely covered with long, dark hair and denser but less conspicuous short, white pubescence; wings clear, with decided yellowish tinge, first recurrent vein contiguous with first transverse cubital; posterior wing with six to eight hamuli; legs not conspicuously modified; fore tibia slightly swollen, half as broad as long; mid tibia with no accessory bristles terminally; hind tibia a little over three times as long as broad, densely pubescent on outer side of apical third, with hairs no longer than tibial width; fore metatarsus three, mid four, hind less than three times as long as broad; second to fourth fore tarsal segments broader than long, those of mid, hind legs longer than broad. *Propodeum:* Enclosure rather sparsely covered with very coarse, wavy carinae presenting an irregularly wrinkled appearance; straight line drawn transversely through middle of enclosure cutting fifteen to twenty carinae. *Abdomen:* Tergites finely, sparsely, but distinctly punctured, first with punctures of summit separated on the average by two or more of their diameters, next two with punctures slightly closer basally but similarly sparse apically; punctures tending to be arranged in transverse rows beyond first tergite; impressed apical tergite borders appear dark brown to nearly black; tergal pubescence rather abundant, forming brownish, scarcely distinguishable hair bands laterally; apical tergite with broad, median longitudinal glabrous area; median hair of tergites largely dark; third, forth sternites each with a pair of sub-lateral hooklets which are short, broad, with oblique bases reaching nearly to segment apices; fourth with slight median apical lobe bearing a few scattered, dark hairs; fifth with glabrous, shiny concavity and emarginate apically, except for a median, flat, triangular projection which is approximately equilateral and one-third as long as sternite proper; sixth with strongly depressed, polished, glabrous, median, longitudinal area, half as broad basally as sternite, sharply narrowing apically to merge with median, apical projection which is as thick as broad, four times as long as broad, nearly as long as sternite proper, with a glabrous, concave summit and nearly parallel sides for the basal three-fourths; posterior arms of seventh very broad, flat, the portions not concealed by basal flaps forming nearly equilateral triangles, the inner margins with short bristles or stiff hairs; apical projection of eighth parallel sided on basal two-thirds, narrowed apically to half the basal breadth.

Female.—Length about 7 mm., length of anterior wing 5 mm.; pubescence mostly pale, with some brown facial and abdominal hair; integument black with very dark blue and copperish metallic tints; body robust. *Head:* Face four-fifths as long as broad; eyes diverging below, their length about five-sevenths the distance between them at antennal insertion; face, viewed directly from in front, with distance

between posterior ocelli more than twice as great as from one of them to vertex margin; distance from antennal socket to clypeus about half socket diameter, clypeus evenly, coarsely, sparsely punctured; facial hair mostly sooty brown; frons closely, moderately coarsely punctured, the punctures usually not contiguous but much less than one puncture width apart; antennae black. *Thorax:* Mesonotum moderately coarsely, densely punctured, punctures averaging less than one puncture width apart except at middle, its surface sparsely covered with short, pale brown to white pubescence interspersed with a few long brownish hairs; fore tibial bristles testaceous; tibial scopa moderately dense, pale brownish, slightly recumbent; mid tibial spur twelve times as long as broad, testaceous, becoming darker on apical half; with ten or fewer large, distinct teeth along apical two-thirds, numerous tiny, very fine, indistinct teeth along basal third, the larger teeth contiguous at their bases and little longer than broad. *Propodeum:* Enclosure coarsely, irregularly carinate throughout, the carinae bending outward sharply posteriorly. *Abdomen:* Tergum shining purplish black, with very dark brown apical tergite borders, uniformly, moderately densely but finely punctured, the punctures fairly distinct but usually setigerous, those of middle of first tergite, bases of second and third little more than their diameters apart; tergal pubescence sparse, mostly dark, hardly longer on tergite apices than elsewhere; anal fimbria dark ferruginous; apical tergite with distinct median carina.

Holotype: Wawona, Yosemite National Park, California, May 21, 1938, from *Gilia* (R. M. Bohart). *Allotype:* Same as for holotype. *Paratypes:* 4 females, 7 males, same data as for holotype; 1 male, Indian Flat, Mariposa Co., Calif., from *Gilia* (R. M. Bohart); 7 males, 2 females, Alta, Eldorado Co., Calif., April, 1947 (R. M. Bohart).

Some variation occurs in the regularity of propodeal carination in this species. The carinae are always coarse and irregular but occasionally traceable from anterior to posterior end.

Cuprea is related to *mulleri* (Ckll.), and *nemophile* (Mich.) but may be readily separated by the dark color and simple legs.

Dufourea trochantera n. sp.

Male.—Length about 8 mm., length of anterior wing 5 mm.; pubescence almost entirely pale; integument black with faint bluish and copperish reflections on head; body slightly elongate when abdomen is extended. *Head:* Face slightly broader than long; eyes converging below, their length nearly equal to distance between them at antennal insertion; face as viewed directly from in front with distance between posterior ocelli no greater than from one of them to vertex margin; area between posterior margin of posterior ocellus and upper margin of eye slightly depressed; distance from antennal socket to clypeus slightly greater than socket diameter; clypeus with abundant, semi-erect hair, short on apical margin, becoming longer toward base, remainder white except for basal fringe of dark hairs which do not conceal integument; supra-clypeal area with dense, reclining, white pubescence; inner eye margins at region of antennal insertion with long, erect, greyish hair; outer eye margins with a few long dark hairs extending around to form sparse, shorter pubescence on frons at the middle, the cheeks and frons

otherwise with white hair; frons dull, coarsely, closely punctured, the punctures nearly contiguous anterior to median ocellus, more separate posteriorly with inter-punctural areas usually roughened; antennae of moderate length, reaching beyond tegulae, with flagellum not at all clavate, dark brown in color, the segments as viewed from above, except second and last, about as broad as long, the second only slightly longer than first, the first five each with from three to five yellowish brown hairs which are as long as flagellar width and have their apical thirds strongly bent towards flagellar apex; scape swollen, more than half as broad as long, with long black hair on inner side, short, dense, white hair on outer and under sides; maxilla with stipes considerably shorter than posterior tibia, slightly shorter than eye; galea slightly less than three times as long as broad, half as long as stipes, sharply pointed apically; maxillary palpus about three-fourths as long as stipes, extending less than three segments beyond galea, the first segment not more than three times as long as broad, slightly shorter than second, both together about as long as next four together of which the middle two are each two-thirds as long as either third or last segment; labial palpus about as long as galea; first segment six or more times as long as broad, distinctly longer than second which is twice the last which is twice the third. *Thorax:* Mesoscutum rather coarsely, unevenly punctured, the anterior part densely, the median part sparsely with punctures separated usually by two or more of their diameters; mesoscutellum uniformly, rather densely punctured; surface of mesonotum with sparse, short white pubescence and a few long dark hairs; wings clear with a yellowish stain, the second transverse cubital vein separated from second recurrent by half its own length; legs rather conspicuously swollen, otherwise modified; fore trochanter produced inwardly into a spine-like process longer than broad; fore femur almost two-thirds as broad as long; fore metatarsus with basal width of the stridulus nearly twice that of segment apex; third, fourth fore tarsal segments produced inwardly, twice as broad as long; mid legs nearly normal, the metatarsus about four times as long as broad, the third, fourth segments nearly twice as broad as long; hind trochanter with under side strongly produced into a sharply carinate ridge, causing the segment to be over twice as broad as long; hind femur quite swollen, two thirds as broad as long; hind tibia arcuate, one-third as broad as long, pubescence of outer side short, sparse, fine, that of inner side forming a ridge of long white hairs, longer than tibial width; hind metatarsus polished, expanded, two-thirds as broad as long, second segment about twice as broad as long, third, fourth slightly broader than long. *Propodeum:* Enclosure coarsely, rather evenly carinate throughout, the carinae strongly diverging posteriorly. *Abdomen:* Tergites distinctly punctured, the punctures mostly not setigerous, separated by little more than one of their diameters on densest areas, a little more separate on summit of first tergite; posterior tergite borders testaceous; hair bands long, white, especially fourth, fifth; apical tergite with longitudinal, median, roughened, glabrous area; third, fourth sternites each with a pair of sublateral tubercles one-third the way from apex to base; fourth polished, impunctate, glabrous on concave ventral surface, terminating in a sharply pointed, flat, sparsely pubescent, median apical projection which

is longer than broad, over half as long as sternite proper at mid line; sixth with strongly depressed, median, longitudinal, glabrous, impunctate area, nearly as broad as long on sternite proper but extending apically as the median concavity of an apical spine-like process which is three times as long as broad, sharply pointed, laterally carinate; posterior arms of seventh as broad basally as their underlying basal flaps and each forming, where not hidden by the flaps, an isosceles triangle, the longest side being the lateral margin of the arm whose inner margin is beset with short bristles becoming long hairs apically; apical projection of eighth broad basally, tapering posteriorly to form a laterally compressed digit no broader than the carina of the base.

Female.—Length about 8 mm., length of anterior wing 5 mm.; pubescence almost wholly pale; integument black with distinct bluish tint on face, very faint purplish copper tint on mesoscutum. *Head:* Face about seven-eighths as long as broad; inner margins of eyes approximately parallel, eye length about six-sevenths the distance between them at level of antennal insertion; as viewed directly from in front, distance from posterior ocelli to margin of vertex a little over half as great as distance between them; clypeus evenly, coarsely, and sparsely punctate with sparse white pubescence and basal fringe of brownish hairs; frons bare except for long, sparse, brown hairs, closely and rather coarsely punctured, the punctures nearly contiguous. *Thorax:* Posterior elevated portion of pronotum short laterally, nearly absent medially; mesoscutum rather densely covered with very short pubescence which nealy obscures integument as viewed from the side and is interspersed with a few long brownish hairs; tibial scopa dense, recumbent, white, slightly brownish on top; mid tibial spur about ten times as long as broad, slightly arcuate, smoothly tapering to a point apically, with about nine teeth, the apical six separated by more than their lengths, apical one equidistant from nearest tooth and spur's apex. *Propodeum:* Enclosure coarsely and irregularly carinate throughout. *Abdomen:* First three tergites distinctly punctured, first one medially, next two basally with punctures separated by little or no more than one puncture width; all tergites except first and last with distinct, complete, white hair bands; abdominal pubescence brownish except in hair bands and anal fimbria where it is ferruginous with an orange tinge; apical tergite with median longitudinal carina. *Holotype* and *allotype:* Mammoth Lakes, Mono Co., California, elevation 9000 ft., July 22, 1936, (G. E., R. M. Bohart). *Paratypes:* 1 male, 1 female, same place as holotype, July 26, 1933, (R. M., G. E. Bohart); 2 males, Big Flat, Coffee Creek, Trinity Co., Calif., June 20, 1934, (G. E. Bohart); 1 male, Weott, Humboldt Co., Calif., June 3, 1936, (E. C. Van Dyke); 1 male, 1 female, Goldlake, Sierra Co., Calif., July 14, 1921, (C. L. Fox); 2 males, 4 females, Lake Tahoe, Eldorado Co., Calif., June 19, 1936, (R. M. Bohart); 1 male, Yosemite Valley, Marispoa Co., Calif., July 8, 1921, (E. C. Van Dyke); 1 male, Mill Valley, Marin Co., Calif., May 2, 1936, (C. L. Fox); 1 female, El Portal, Mariposa Co., Calif., May 18, 1938 (R. M. Bohart); 1 male, 2 females, Giant Forest, Tulare Co., Calif., July 21, 1923, (C. L. Fox); 1 female, Mono Lake, Mono Co., Calif., (G. E. Bohart); 15 males, Mineral King, Tulare Co., Calif., on *Phacelia*, (R. M. Bohart); 4 females, 1 male, McKenzie Ridge, Lane Co., Oregon,

July 20, 1909, (J. C. Bridwell); 1 male, Timberline Lodge, Mt. Hood, Oregon, July 23, 1937, (E. C. Van Dyke); 11 males, 8 females, Jenny Lake, Grand Teton Nat. Park, Wyoming, June, 1941, on *Phacelia*, (G. E. Bohart); 4 males, 6 females, Logan, Utah, June 12, 1947, on *Phacelia*, (G. E. Bohart); Three females collected by the author on Bogacheil Mtn., Mt. Olympus Nat. Park, Wash., August 4, 1938, on *Phacelia* are apparently *trochantera* but are a little darker than usual in color.

The series from which this species was determined shows slight variations in number of antennal hairs, in length of the process of the fifth sternite, and in degree of metallic color on the face. The females vary somewhat in size and as to amount of abdominal pubescence and completeness of hair bands.

This is related to *mulleri* (Ckll.) from which it can be separated by the produced trochanter of the male. No constant character with which to distinguish the females was discovered.

Dufourea vandykei n. sp.

Male.—Length about 9 mm., length of anterior wing 5.2 mm.; pubescence wholly pale; integument black, without tinge of blue, green, or copper; body elongate. *Head:* Face a little less than five-sixths as long as broad; eyes very slightly diverging below, their length about three-fourths the distance between them at antennal insertion; face, viewed directly from in front, with distance from lateral ocelli to vertex margin about two-thirds the distance between them; distance from antennal socket to clypeus nearly two-thirds socket diameter; clypeus concealed by dense, white, reclining hair tuft, extending beyond clypeus for distance equal to clypeal length; supra-clypeal area also concealed, its lateral margins with hair becoming long, grey, more erect; punctures of frons rather coarse, dense, separated by less than one puncture width except along inner eye margins, and near ocelli; antenna of moderate length, not reaching beyond tegula; scape swollen, three-fifths as broad as long; flagellar segments, seen from above, slightly longer than broad, the second somewhat longer than first or third, two-thirds as broad as long, the first four entirely black, roughened; entire flagellum with a single row of thick, white, sensory hairs, bent at right angles near their middles, a little shorter than flagellar width, usually two in number per segment, six on first, four on second, third; maxilla with stipes shorter than hind tibia, no longer than eye; galea three times as long as broad, pointed apically; maxillary palpus three-fourths as long as stipes, first segment three times as long as broad, as long as second, one-third its length longer than last, nearly twice as long as any of others; labial palpus only half as long as mentum, first segment about seven times as long as broad, distinctly longer than second maxillary, as long as next three labial together which are sub-equal. *Thorax:* Mesoscutum rather dull, moderately coarsely, closely punctured, punctures averaging a little more than one puncture width apart, surface moderately densely clothed with long, white hair; wings clear with slight yellowish tinge, first transverse cubital vein offset from first recurrent by half its own length; posterior wing with eight hamuli; legs not conspicuously modified; fore femur swollen along its outer side, half as broad as long, nearly

as thick as broad, with but few scattered hairs; mid tibia with short, rather close hair; hind tibia slightly broadened subapically, two-sevenths as broad as long, with pubescence shorter than tibial breadth; metatarsi each about four times as long as broad; succeeding segments as long as or longer than broad. ***Propodeum:*** Enclosure shining, sparsely, rather coarsely, evenly carinate, the carinae not attaining posterior margin of enclosure, about twenty in number. ***Abdomen:*** Tergites coarsely, closely punctured, summit of first, apical thirds of others with punctures somewhat more than one puncture width apart, tergite bases more closely punctate; impressed apical tergite borders clear, nearly colorless; tergal pubescence scanty, forming weak hair bands laterally, pale at centers of tergites; apical tergite with narrow, longitudinal, median, glabrous line; depressed areas of sternites strongly defined; second with sub-lateral, sub-apical swellings; third, fourth each with a pair of sublateral, apical hooklets and a dense apical pubescent band; fifth transversely swollen along the apical margin which is evenly emarginate; sixth with a broad, raised, median longitudinal, testaceous, minutely pubescent area, as broad as long, with lateral margins converging strongly towards a flame-shaped apical projection, which is nearly concealed by a long, dense, white hair tuft; posterior arms of seventh very broad, flat, rounded apically, with apical yellow hair tufts half as long as arms; terminal projection of eighth basally broadened, narrowest at middle, becoming imperceptibly broader at apex where it is one-fourth as broad as base.

Female.—Length about 8 mm., length of anterior wing 5.1 mm.; pubescence wholly pale; integument black as in male; body robust. ***Head:*** Face four-fifths as long as broad; eyes approximately parallel, very slightly divergent below, their length three-fourths as great as the distance between them at antennal insertion; face, viewed directly from in front, with distance between posterior ocelli over twice that from one to vertex margin; distance from antennal socket to clypeus about half socket diameter, distance between sockets over twice as great as their diameters; clypeus short, covered with white pubescence, with about twenty large, scattered punctures; hairs of frons almost all white, surface coarsely, moderately densely punctured, but separated by at least one of their diameters along inner eye margins and a broad band in front of ocellar triangle; antennal flagellum dull brown above on apical six segments. ***Thorax:*** Posterior lateral angle of pronotum with dense white hair pad; mesoscutum moderately finely, rather sparsely punctured, punctures of densest areas along anterior margin separated by about one puncture width, of remainder by two or three; mesonotum sparsely covered with short, fine hairs interspersed with fewer long, pale ones; terminal bristles of fore, mid tibiae testaceous; mid tibial spur testaceous, straight, evenly tapered to a point, with about nine fairly prominent teeth on apical half, numerous very fine ones on basal half; tibial scopa rather sparse, pale with greyish hairs on dorsal margin. ***Propodeum:*** Enclosure shining, posterior third smooth, remainder with about twenty coarse, straight carinae with clearly visible interspaces. ***Abdomen:*** Tergites well punctured, summit of first, basal halves of others with punctures separated by about or little more than one puncture width; impressed, apical tergite borders pale testaceous;

pubescence of first four tergites short, scanty, forming sparse hair bands laterally, covering rather denser ones under tergite borders; median hair of fifth tergite brown; anal fimbria testaceous.

Holotype, allotype, 20 male ***paratypes:*** Westgard Pass, Inyo Co., Calif., June 3, 1937, from ***Sphaeralcea ambigua*** (J. W. Johnson, N. W. Frazier, E. C. Van Dyke, C. D. Michener). Other ***paratypes*** include: 2 males, 3 females, near Kearsarge, Inyo Co., Calif., May 25, 1937 (E. C. Van Dyke); 2 males, Lone Pine, Inyo Co., Calif., and one male, Keeler, Inyo Co., May 22, 1937 (E. Gehrhardt); 2 males, Mazourka Canyon, Inyo Co., Calif., elevation 6000 feet, on ***Sphaeralcea ambigua,*** May 23, 1937; 1 male, Chocolate Mountains, Riverside Co., Calif., April 4, 1937 (E. G. Linsley); 1 male, Yermo, Calif., April 4, 1940 (Evernham).

The specimens in this series vary somewhat as to density of punctation and as to hair color which tends to become yellowish on some.

This species has no close relatives. Probable affinities can be traced to the ***echinocacti*** Timb. group. It differs strongly, however, in the possession of sternal hooklets, lack of leg modifications, and a broad head.

Dufourea pectinipes n. sp.

Male.—Length about 6 mm., length of anterior wing 4 mm.; pubescence white except for some brown clypeal hair; integument dark with bluish, greenish reflections; body elongate. *Head:* Face distinctly longer than broad; eyes converging slightly below, distance between them at antennal insertion a little greater than their length; face, viewed directly from in front, with distance between lateral ocelli about twice that from one to posterior vertex margin; distance from antennal socket to clypeus nearly as great as socket diameter; clypeus nearly half as long as broad, with mixed brown, white sparse hairs, not concealing integument; frons well rounded, rather strongly bluish, non-reticulate, mostly with punctures much less than one puncture width apart; antenna long, reaching beyond tegula, flagellar segments smoky dark brown to black, without distinct rows of sensory hairs, the second segment somewhat longer than first, a little shorter than third, the first three wholly roughened, elevated above on apical halves; scape a little more than twice as long as broad; maxilla with stipes slightly longer than hind tibia; galea nearly as long as stipes, over five times as long as broad; maxillary palpus as long as stipes, not quite attaining tip of labial, first segment four times as long as broad, subequal to fourth, slightly longer than fifth or sixth, three-fourths second or third which are half as long as second labial; labial palpus longer than mentum, first segment eight times as long as broad, equal to second, twice the third, nearly four times the fourth. *Thorax:* Mesoscutum coarsely, moderately closely punctate, punctures on average separated by distinctly less than one puncture width, no closer laterally except on anterior margin; area between punctures shining, non-reticulate; surface of mesonotum with short, sparse, pale pubescence; wings clear but somewhat yellowish, with dark veins, the first transverse cubital vein contiguous with first recurrent; posterior wing with five to six hamuli; legs somewhat deformed, modified; fore tibia slightly swollen, with broad, prominent terminal

hooklet directed at right angles to tibial axis; mid tibia swollen, its greatest breadth somewhat beyond middle where it is half as broad as long, its apex with two concealed, short, dorsal bristles, a long curved median hooklet, a ventral clump of five or more stout, yellowish bristles; hind tibia nearly four times as long as broad, outer surface shining, very sparsely haired; fore, hind metatarsi four times as long as broad, mid one three times; second to fourth fore tarsal segments broader than long. *Propodeum:* Enclosure closely, slightly irregularly carinate, becoming smooth on apical lateral corner; imaginary line drawn transversely through center cutting about thirty carinae. *Abdomen:* First three tergites rather strongly punctured, punctures separated by little less than one of their diameters on summit of first, anterior halves of second, third; abdominal pubescence brown, very short, sparse, not forming distinct hair bands; apical impressed tergite borders testaceous to clear; third sternite with low, lateral swelling but no distinct hooklet; fourth with sub-apical, sub-lateral hooklet and with apical margin evenly convex between lateral emarginations; fifth with low, unthickened, median swelling on apical half; sixth with broad, median, longitudinal, glabrous, convex, pale band, defined laterally by groove, the band extending apically to form a broadly flame-shaped, pointed projection, about equal in length to band of sternite proper, the projection not crowned with dense hair tuft except at apex, the lateral margins with long hairs; seventh with posterior arms as broad basally as their basal ventral flaps, tapering evenly from bases to narrow, apical, diagonal truncations, the apical portions slightly thickened, with long apical hairs becoming short along lateral margins; apical projections of eighth basally broadened, narrowest at middle, expanding almost imperceptibly towards apex which is one-third basal breadth.

Female.—Length about 5 mm.; length of anterior wing 3.7 mm.; pubescence brownish to whitish; integument dark with dark blue metallic reflections (some violet on abdomen); body robust. *Head:* Face slightly longer than broad; inner eye margins parallel; eye length as great as distance between them; face viewed from front with postocellar distance less than ocellar diameter; area laterad, posterior to posterior ocellus well rounded; distance from antennal socket to clypeus about equal to socket diameter; clypeus one-half as long as hind metatarsus, with semi-erect brown hair; frons closely, coarsely punctured, the punctures much closer than one puncture width apart, even close to ocelli; flagellum dull yellowish brown above on last eight segments; galea beyond maxillary palpus as long as hind tibia, maxillary palpus somewhat longer. *Thorax:* Dorsal surface closely, coarsely punctured as the frons; pubescence rather short, erect, gray to brownish; fore and mid tibiae each with an outer apical fringe of curved testaceous spines; hind wing with six hamuli. *Propodeum:* Enclosure closely, coarsely, somewhat irregularly carinate, a straight line drawn transversely across the middle cutting about twenty-five carinae. *Abdomen:* Tergites uniformly, rather strongly punctured, the first with punctures of disk averaging from one to two puncture widths apart; apical tergite borders pale testaceous, not at all hidden by sparse, testaceous hair fringes; anal fimbria testaceous.

Holotype and 2 male *paratypes:* Tuolumne Co., California, elevation

3500 feet, June 9, 1938, from *Mimulus layneae*, (R. M. Bohart). *Allotype:* Oakhurst, Madera Co., California, May 19, 1942, from *Mimulus*. Two male *paratypes:* Shingletown, Shasta Co., Calif., June 2, 1941, from *Mimulus*, (C. D. Michener).

One of the paratypes and the allotype have a distinct offset between the first transverse cubital and first recurrent veins. The males are otherwise quite similar.

The male of this species resembles *D. versatilis* Bridwell in many details and must be related in spite of the fact that *versatilis* was described as a separate genus (*Mimulapis*) and has generally been separated by later authors. The female resembles *versatilis* somewhat (particularly in the mouthparts) but also seems to be related to *D. bernardina* (Michener), from which it can be distinguished at once on the basis of its long galea, glossa, and palpi.

Dufourea longiceps n. sp.

Male.—Length about 7 mm., length of anterior wing 4.9 mm.; pubescence almost entirely white; integument black without tinge of blue, green, or copper; body elongate. *Head:* Face five sixths as broad as long; eyes converging slightly below, distance between them at antennal insertion a little less than eye length; face, as viewed directly from in front, with space between posterior ocelli about twice that from one to posterior vertex margin; distance from antennal socket to clypeus distinctly greater than socket diameter; face of clypeus markedly convex, crowned with long, white, reclining pubescence, continuing on supraclypeal area, bounded laterally by fringe of long, dark, brown hair; frons above antennal scapes with long sparse hair, its surface non-reticulate, coarsely, moderately densely punctured, punctures separated on average by more than one puncture width along inner eye margins and laterad to posterior ocelli, about or somewhat closer than one width otherwise; antenna long, reaching beyond mesoscutum, flagellum almost imperceptibly clavate, first segment four-fifths as broad as last, slightly longer than broad, three-fourths as long as second which is no longer than succeeding segments which are each two-thirds as broad as long seen from above; flagellum yellow above and on outer side beyond middle of first segment, the segments glabrous except for usual uniform microscopic pubescence, with rough areas on upper surface beyond second segment confined to small, raised, apical rings; scape nearly three times as long as broad with mostly long, white hairs, few short dark ones; maxilla with stipes slightly longer than hind tibia, one-third its length longer than eye; galea three times as long as broad, less than half as long as stipes, narrowly rounded apically; maxillary palpus nine tenths as long as stipes, first segment four times as long as broad, two thirds as long as second, little longer than any of remaining segments which are subequal; labial palpus about three fourths as long as stipes, first segment nearly ten times as long as broad, as long as next three combined, the last two subequal, each two thirds as long as second. *Thorax:* Mesoscutum coarsely, rather uniformly punctate, punctures mostly about one width apart; punctures of mesoscutellum a little more separate; mesonotum covered with moderately long, sparse white pubescence, some shorter hair, especially laterally; wings clear hyaline,

practically without greyish or yellowish tinge, veins, stigma nearly black, first transverse cubital vein separated from first recurrent by its own length; legs not conspicuously modified; mid tibia with two stout, testaceous bristles on apical fourth of posterior margin in addition to normal tibial bristle; fore metatarsus beyond stridulus, mid metatarsus at least four times as long as broad, succeeding segments longer than broad; hind tibia over four times as long as broad, densely covered, especially apically, with white pubescence no longer than tibial width; hind metatarsus broadened, about half as broad as long, succeeding segment produced posteriorly, as broad as long, remaining segments longer than broad. *Propodeum:* Enclosure strongly, closely, somewhat irregularly carinate, straight transverse line drawn through middle cutting about twenty-five carinae, the vertical posterior portion thrown into transverse carinae. *Abdomen:* Tergites with uniformly spaced, coarse punctures, those of first four averaging a little more than one puncture width apart; apical impressed margins of tergites apically clear on first three, mostly dark on others; tergal pubescence scattered, sparse, forming distinct hair bands only laterally, that of middles of third to fifth; tergites dark; third and fourth sternites each with a pair of sub-lateral, small, blunt, scarcely curved hooklets, distant from apical margin, second to fifth approximately truncate apically; sixth with a median, longitudinal, raised, impunctate, glabrous area on basal third, its sides converging posteriorly, its surface elevating on posterior half of segment to form a glabrous, thorn-like ridge, dropping abruptly from its apex posteriorly just before sternite apex which bears a minute raised point; posterior arms of seventh broad basally, less than twice as long as their basal ventral flaps, their apices sharply pointed, with short hairs, their inner margins straight; apical projection of eighth with long, lateral hair fringe, narrowest part one third the distance from apex where it is half as broad as at apex or base.

Female.—Length about 7 mm., length of anterior wing 5 mm.; pubescence largely pale; integument black as in male; body rather robust. *Head:* Face longer than broad by distance behind ocelli; inner eye margins approximately parallel, distance between them at antennal insertion a little greater than eye length; median ocellus distinctly posterior to eye; face, as viewed directly from in front, with distance between lateral ocelli about twice that from one of them to posterior margin of vertex; clypeus produced, strongly convex, with a few scattered punctures of large and small size, with basal fringe of black hairs which continue along sides of supra-clypeal area, inner eye margins, surface of frons; middle of supra-clypeal area, antennal scapes, interscapal area with mostly pale hair; frons rather coarsely punctured, the punctures sparse along inner eye margins, about one puncture width apart over rest of frons, except latero-posteriorly where they are more close, coarse; antennal flagellum dull yellowish brown above on apical three fourths. *Thorax:* Elevated posterior portion of pronotum distinct laterally but almost obsolete medially; mesoscutum coarsely, uniformly punctate, the punctures mostly separated by about one of their diameters; mesoscutellar punctures more separate medially; mesonotum sparsely covered with mostly dark brown to black, short and moderately long hairs; apical bristles of fore, mid tibiae testaceous, frequently with

black tips; mid tibial spur testaceous, straight, about fifteen times as long as broad, the basal half without distinct teeth, the apical half with only about five teeth which are reclining, rather fine; tibial scopa rather dense, arising from tibia at more than a fifty degree angle, white except for coarser, shorter, darker hairs at base and along upper margin. *Propodeum:* Enclosure completely, rather coarsely, closely, evenly carinate, the median carinae tending to converge posteriorly, the posterior margin with several transverse carinae; a straight line drawn through middle of enclosure cutting about twenty carinae. *Abdomen:* Tergites rather coarsely punctured, punctures of first, apical halves of next two mostly two of their diameters apart, those of basal fourth of second, third closer but finer; tergal pubescence very sparse, hair bands generally confined to lateral margins or to bases of tergites; pubescence at middle of tergites mostly short, dark; anal fimbria dark sooty brown.

Holotype.—Wildrose Canyon, Panamint Mts., Inyo Co., Calif., May 27, 1937, from *Phacelia*, (C. D. Michener). *Allotype* and one *paratype* female: Same as for holotype.

This can be placed with the same group as *novae-angliae* (Robt.) and *monardae* (Vier.) but is not very close to either of them. It is easily separated by its mostly pale pubescence, yellow antennae, colorless wings, and absence of lateral swellings on the sixth sternite of the male.

Dufourea afasciata n. sp.

Male.—Length about 12 mm., length of anterior wing 8 mm.; pubescence mostly pale on head, thorax, mostly black on abdomen; integument jet black with no tinge of blue, green, or copper. *Head:* Face distinctly longer than broad; eyes converging slightly below, distance between them at antennal insertion slightly less than eye length; face, viewed directly from in front, with distance between posterior ocelli no greater than from one of them to posterior vertex margin; frons between eyes and between posterior ocellus and upper eye margin depressed; distance from antennal socket to clypeus greater than socket diameter; clypeus with abundant, long, semi-depressed, yellowish white hair not entirely concealing integument; supra-clypeal area strongly convex, carinate medially; frons between eye, scape with abundant long, fine, pale hairs; frons moderately finely, unevenly punctate, the punctures very fine, close just anterior to impunctate area in front of ocelli, coarser, separated by a puncture width along inner margins of eyes, very sparse just posterior and laterad to lateral ocellus; interpunctural areas mostly reticulate, otherwise roughened; antenna very long, reaching beyond base of abdomen, the flagellar segments yellow above and on outer side, swollen sub-apically, glabrous except for usual uniform, microscopic pubescence, over twice as long as broad, the last shorter than any except first, the second three times as long as broad, unswollen, the first black, only slightly longer than broad as seen from above; maxilla with stipes distinctly longer than hind tibia or eye; galea over four times as long as broad, over half as long as stipes, rounded apically; maxillary palpus longer than stipes, the first segment nearly half as broad as long, about two-thirds as long as second which is slightly longer than third, one-fourth its length longer than fourth or

fifth, about as long as sixth; labial palpus with segment one about six times as long as broad, one-fourth its length longer than second or third, twice as long as fourth, as long as second maxillary palpal segment. *Thorax:* Mesonotum rather dull, moderately closely, coarsely punctured, the punctures, except at middle, mostly somewhat less than one puncture width apart, surface densely clothed with greyish white, mostly long hairs which partially conceal the integument even from dorsal view; mesepisternum densely clothed with long pale hairs; wings clear, with rather strong tinge of smoky yellow; first transverse cubital vein offset from first recurrent by less than half its own length; posterior wing with about fourteen hamuli; legs greatly swollen and modified; coxae, trochanters normal; fore femur slightly swollen sub-basally on inner side; mid femur with inner side tremendously enlarged, causing the segment to be shaped like a semicircular glabrous plate; hind femur swollen, strongly concave beneath, inner margin of the concavity forming a high, sharply carinate ridge which is produced backward toward the coxa as a long, flat, spine-like process; fore tibia greatly swollen, two-thirds as broad as long, its posterior margin with a deep, sub-apical, semi-circular notch cradling proximal end of tibial spur which is produced proximally, distally; mid tibia with a strong hump near the middle of its outer ventral side, the hump as broad as long, bounded distally by a large, semi-circular notch close to tibial apex which overhangs metatarsus; mid tibial spur four times as long as broad; hind tibia two-thirds as broad as long, its dorsal margin sharply carinate, its ventral outer side near base with a compact row of long, dense black hairs which extend distally onto base of a long, curved, spinular process, bounded distally by a compact row of long white hairs; fore metatarsus nearly half as broad as long; mid metatarsus one-third as broad as long, its outer side polished, glabrous, its margins curved, twisted; hind metatarsus greatly expanded, about three times as long as fore one, nearly half as broad as long, its outer side concave, obscured by fine, exceedingly dense, pale hair becoming coarse, black on dorsal margin; second to fourth fore tarsal segments considerably broader than long. *Propodeum:* Horizontal portion of enclosure twice as long as metanotum, strongly but evenly carinate, the carinae mostly separating anteriorly, their number on the median half more than forty. *Abdomen:* Tergites entirely black, pubescence coarse, black, not forming hair bands; on tergites four to six, mostly pale, but fine on one to three; tergal punctures entirely setigerous, uniformly, rather densely covering surface, except for posterior borders; fourth sternite depressed medially, densely hairy laterally, with a broad, flat, truncate lobe at apex bearing a short terminal hair fringe; fifth reduced to a transverse band with a strong, median transverse fold, the sub-lateral apical margin with a pair of hooklets modified into broad, flat, tooth-like structures; sixth with a broad, median, slightly elevated, shining area, extending apically to form a transverse roughened ridge which is bounded apically by the flat, depressed, broad base of an apically thickened, raised sternal projection twice as long as its greatest breadth; posterior arms of seventh obsolete, replaced by their greatly enlarged, thickened, ventral basal flaps, apical projection of eighth about five times as long as broad, medially carinate, broader sub-apically than apically, with lateral

margins densely haired, those of sub-apex bearing long, backward curled, golden pile.

Female.—Length about 11 mm., length of anterior wing 7.5 mm.; pubescence black except for dorsum of thorax; integument jet black; body moderately robust. *Head:* Face slightly longer than broad; inner eye margins nearly parallel, distance between them at antennal insertion about as great as eye length; face, viewed directly from in front with distance between posterior ocelli a little greater than from one to posterior vertex margin; distance from antennal socket to clypeus equal to socket diameter; clypeus rather long, truncate apically, with a few large scattered punctures; supra-clypeal area with a strong, median longitudinal ridge, very finely punctured; frons unevenly, rather finely punctate, very closely, nearly contiguously punctate medially but coarsely, sparsely so along inner eye margins; antennal flagellum black. *Thorax:* Elevated posterior portion of pronotum nearly as prominent medially as laterally; mesoscutum dull, closely, rather coarsely punctate anteriorly, more sparsely medially and posteriorly, punctures mostly about one puncture width apart, the inter-punctural areas distinctly reticulate; mesoscutellum sparsely punctate, the punctures mostly two or more of their diameters apart; mesonotum with surface densely covered by long, greyish white pubescence nearly concealing integument; terminal hooklets of fore, mid tibiae black, stout; mid tibial spur ferruginous, straight, a little more than six times as long as broad, with over twenty teeth on apical three-fourths; tibial scopa coarse, jet black, dense, concealing integument. *Propodeum:* Horizontal portion of enclosure twice as long as metanotum, strongly but evenly, rather closely carinate, a straight line drawn transversely from center of enclosure cutting at least twenty carinae. *Abdomen:* Tergum finely reticulate, entirely jet black, punctures obsolete or minute, setigerous; pubescence of last four tergites coarse, black, of first two somewhat finer, partially pale; white hair bands confined to bases of segments, scarcely visible even with abdomen extended; anal fimbria black; apical tergite with strong median carina.

Holotype: Shasta Springs, Shasta Co., Calif., June 16, 1920, (C. L. Fox); *Allotype:* Prospect, Oregon, June 20, 1924, (C. L. Fox); *Paratypes:* 3 males, 3 females, Trinity Co., Calif., May 16 to 18, 1934, from *Trifolium*, (G. E. Bohart); 3 males and 1 female, same data (E. C. Van Dyke); 1 male, Hanson's Resort, Jefferson Co., Oregon, July 29, 1929, (E. C. Van Dyke).

Despite the grotesque characters of this species, available specimens show no significant variation.

This belongs with *D. spinifera* (Viereck) in an aberrant group called *Cryptohalictoides* by Viereck. The female lacks the conspicuous white abdominal hair bands characteristic of *D. spinifera* and the male differs in details of the fore and hind tibiae. Both sexes have more finely carinate propodea.

Dufourea dentipes n. sp.

Male.—Length about 12 mm., length of anterior wing 7.5 mm.; pubescence mostly black; integument almost entirely jet black with occasional very faint reflections of blue or copper on head; body robust.

Head: Face a little over three-fourths as long as broad; eyes strongly diverging below, their length two-thirds the distance between them at antennal insertion; face, viewed directly from in front, with distance between posterior ocelli no greater than from one of them to posterior margin of vertex; posterior ocelli cut by imaginary line drawn between upper eye margins; distance from antennal socket to clypeus about half socket diameter; clypeus sparsely pubescent, with mostly black hairs basally, mixed black, white apically, surface closely punctured, the apical margin strongly convex; supra-clypeal area with a low tubercle near clypeal margin just laterad to antennal socket; frons moderately finely, closely punctured, punctures anterior to ocelli mostly separated by much less than one puncture width, those in concave area lateral to ocelli and behind median ocellus sometimes separated by one or more puncture widths; interpunctural areas reticulate; antennae of moderate length, about reaching tegulae; flagellum black, slightly clavate, three-fourths as broad at base as at apex, all segments longer than broad but only slightly so except second, last; outer, under side of flagellar segments three to eight each with a row of black hairs, never more than ten in number per segment, bent at their middles, the longest two-thirds flagellar width, those of segments seven, eight short, inconspicuous; scape at least three times as long as broad; maxilla with stipes shorter than hind tibia, no longer than eye; galea three times as long as broad, rounded apically; maxillary palpus extending two segments beyond galea, about half as long as stipes, the first segment two and one-half times as long as broad, as long as second, about twice as long as any of remaining; labial palpus as long as first four maxillary palpal segments together, the first six times as long as broad, over twice as long as second, first two as long as first two maxillary palpal segments, last two together three-fourths as long as first. *Thorax:* Mesoscutum evenly, rather finely, closely punctured, the punctures nearly contiguous and interpunctural areas roughened, surface rather densely pubescent with numerous short pale hairs obscured by long black ones; wings rather strongly stained with grey, yellow, the first transverse cubital vein nearly contiguous with first recurrent; legs somewhat swollen, modified; fore metatarsus, tibia with numerous short white hairs in additoin to the long black ones; apical tooth of mid tibia short, straight, blunt; second, third tarsal segments of fore leg about as long as broad, fourth broader than long; hind trochanter with inner side produced subapically into a rounded hump, causing the segments to be slightly broader than long; hind femur swollen but not broadened; hind tibia considerably broadened, with subapical ventral tooth, the segment a little less than three times as long as broad, its pubescence nowhere more than half as long as tibial breadth; hind metatarsus nearly four times as long as broad, following segment nearly twice as long as broad, the penultimate as broad as long. *Propodeum:* Enclosure dull, minutely wrinkled, appearing granular, the wrinkles transverse on posterior margin. *Abdomen:* Tergites strongly reticulate but nearly impunctate, the punctures separated by many puncture widths and generally setigerous; apical tergite borders black; bases of tergites, when exposed, with short white hair fringes; apical tergite with well differentiated, median, glabrous, wrinkled area encompassing entire tergite breadth on apical

half, its terminus weakly emarginate; second sternite broadly swollen just basad to middle; third, fourth with rather strongly convex apical margins, sharp, inwardly directed, prostrate hooklets sub-laterally about one-third distance from apex to base; fifth nearly truncate apically; sixth with median, shining, glabrous, depressed, triangular area situated at base of broad, elevated, median area of sternite, with surface bearing dense, short pubescence, its sides rounding in sharply at sub-apex of sternite proper, then extending posteriorly to form a bi-lobed, flat, but laterally carinate, projection which is broader than long, nearly as long as middle of sternite proper; posterior arms of seventh slightly narrower basally than their basal ventral flaps, broadly rounded apically, provided with lateral hair tufts; apical projection of eighth basally broadened, narrowest along middle half, broadened apically to twice narrowest width, not more than one-fourth basal width.

Female.—Length about 10 mm., length of anterior wing 7.5 mm.; pubescence almost entirely black; integument entirely jet black; body robust. *Head:* Face three-fourths as long as broad, eyes diverging below, their length three-fourths the distance between them at antennal insertion; face, as viewed directly from in front, with distance between posterior ocelli no greater than from one to posterior vertex margin; distance from antennal socket to clypeus about half socket diameter; anterior margin of clypeus strongly rounded, surface coarsely punctured, punctures averaging about one of their diameters apart, sub-lateral basal corner with triangular, impunctate, brownish callosity; labrum with polished disk sharply pointed apically; supra-clypeal area, cheeks with few short whitish hairs; frons moderately coarsely, quite densely punctured, punctures nearly contiguous except along lower, inner eye margins and on slightly concave area laterad to posterior ocelli where they are more separate; interpunctural areas reticulate; antennal flagellum black. *Thorax:* Posterior lateral angle of pronotum with pale pubescence; mesoscutum densely, uniformly punctured, punctures rather fine, separated by much less than one puncture width, occasionally sub-contiguous, surface with marginal greyish pubescence, otherwise with complete but sparse, long black pubescence; apical bristles of fore, mid femora black or fumose; mid tibial spur about ten times as long as broad, straight, entirely dark reddish brown, with twelve teeth, basal three very small, apical three broad, separated by more than their lengths; tibial scopa dense, coarse, black, appressed. *Propodeum:* Enclosure satiny, entirely covered with minute longitudinal carinae; imaginary line drawn through middle cutting nearly one hundred. *Abdomen:* Tergites reticulate, nearly impunctate, the punctures fine, setigerous, separated by many puncture widths according to density of pubescence; impressed apical tergite borders black; elevated bases of tergites, when extended, with very short but complete white hair fringes, tergal pubescence otherwise black, not forming hair bands; anal fimbria black.

Holotype: Hasting's Natural History Reservation, Santa Lucia Mts., Jamesburg, Monterey Co., Calif., May 24, 1938, (C. D. Michener), *Allotype:* Bass Lake, Madera Co., Calif., June 9, 1937, (B. E. White). *Paratypes:* 23 males, 5 females, same place as holotype, May 14, 22, 24, 25, 1938, from *Calochortus*, *Stachys*, (C. D. Michener); 2 males, same

locality as allotype, June 8, 1938, (Carl T. Sierra); 1 female, Santa Paula, Ventura Co., Calif., May 22, 1936; 1 male, Mt. Hamilton, Santa Clara Co., Calif., April 26, 1913, (J. C. Bridwell); 1 female, Marsh Creek Springs, Contra Costa Co., Calif., May 12, 1937, (G. E. Bohart); 2 males, Northfork, Madera Co., Calif., June 7, 1933, (B. E. White); 1 male, Mokelumne Hill, Calaveras Co., Calif., March 5, 1893, (J. C. Bridwell); 1 female, Palo Alto, Calif., May 19, 1940, (E. S. Ross).

There is no significant variation in the type series. In some specimens the propodeum appears granulose unless examined carefully. This is a very distinct species, probably belonging to the ***maura*** (Ckll.) group which includes ***dilatipes*** Bohart, ***campanulae*** (Ckll.), and probably ***calochorti*** (Ckll.). The male can be easily recognized by its sixth sternite which has a bilobed process and by the tooth on the hind tibia.

Dufourea dilatipes n. sp.

Male.—Length about 9 mm.; length of anterior wing 7 mm.; integument intensely jet black, dull, reticulate; pubescence mostly black to dark brown; body robust. ***Head:*** Face thirteen-fifteenths as long as broad; eyes strongly divergent below, their length less than two-thirds the distance between them at antennal insertions; face, viewed from in front, with postocellar distance greater than distance between posterior ocelli; area laterad to posterior ocelli depressed; distance from antennal socket to clypeus two-thirds socket diameter; clypeus nearly flat, gently rounded at apical margin, punctured as frons, covered with erect black hair but with pale brown ones on margin; punctures of frons in general less than one puncture width apart but much sparser in areas in front of and laterad to ocelli and behind eyes; antenna short, not reaching beyond tegula, black to dark brown; scape two and one-half times as long as broad; flagellum with underside, especially basal half, with numerous straight pale hairs, not confined to rows, about one-fourth as long as flagellar width, thirty or more on basal segments; maxilla with stipes as long as hind tibia; galea two-fifths as broad as long; maxillary palpus four-sevenths as long as stipes, the first segment nearly half as broad as long, as long as second, one-fourth its length longer than any of remaining segments; labial palpus slightly longer than first four maxillary palpal segments, the first about twice as long as second which is a little longer than third or fourth. ***Thorax:*** Mesoscutum rather finely punctured, the marginal areas with punctures from one to two puncture widths apart, the central disk shining, with punctures from three to five widths apart; mesoscutal pubescence long, dark brown, erect; mesoscutellar and mesepisternal pubsecence hoary from some angles; wings slightly yellowish, the first transverse cubital vein contiguous with first recurrent; legs expanded and especially the hind ones strongly modified; fore, mid tibiae thickened, about two-fifths as broad as long; fore metatarsus slightly more than twice as long as broad; hind trochanter produced posteriorly into triangular lobes; hind femur globose, five-eighths as broad as long; hind tibia nearly three-fourths as broad as long, broadly truncate apically, with rather short pubescence; hind metatarsus over three times as long as broad, succeeding segments as broad as long, produced posteriorly. ***Propodeum:*** Enclosure finely rugocarinate laterally, rather coarsely rugose medially, appearing

granular posteriorly. *Abdomen:* Tergites reticulate, with numerous very fine, setigerous punctures; tergites five and six with complete subapical hair bands; third and fourth sternites each with a pair of sublateral recurved hooklets near the apical margin; fourth with a flat, downcurved, median, apical, triangular projection; fifth deeply emarginate apically, the emargination nearly truncate; sixth with a median polished plate, broader than long and a heavy, black, rudder-like, median, apical projection, laterally clothed with long black hair; posterior arms of seventh greatly expanded and thickened apically, clothed with wooly grey-brown pubescence; posterior projection of eighth downcurved, with a heavy apical knob twice as broad as base; genitalia with gonostylus and gonocoxite slender, merged together.

Female.—Length 9 mm.; length of anterior wing 6 mm.; integument and pubescence as in male but with short basal white hair fringes on abdomen; body robust. *Head:* Shape of face as in male but more rounded in profile, with longer, less flattened clypeus, and shorter postocellar space; clypeus, median to apical tubercles, with less than 50 rather coarse punctures; facial punctation otherwise similar to male; antenna colored as in male; facial pubescence entirely black, long. *Thorax:* Punctation and pubescence similar to male; wing with first transverse cubital vein offset from first recurrent by one-third its own length; legs heavy with pubescence black basally to brown and golden on tarsi; mid tibial spur with fine close set teeth; tibial scopa dense, black. *Propodeum:* Enclosure appearing finely granular laterally and feebly, irregularly carinate medially. *Abdomen:* Tergites with numerous tiny, setigerous punctures; subapical black hair bands sparse and complete only on tergite five; tergite bases with short white hair bands, hidden medially except on tergite four which is extended; anal fimbria sooty brown to black.

Holotype, allotype, 2 male and 2 female *paratypes:* Two Medicine Lodge, Glacier National Park, Montana, July 6, 1938 (E. C. Van Dyke); 2 female and 9 male paratypes, Lake St. Marys, Glacier National Park, Montana, July 7 and June 1, 1938, and July 3, 1930 (all E. C. Van Dyke); 2 male and 5 female *paratypes,* Waterton Lakes Nat. Park, Alberta, July 11, 1923, (E. H. Strickland).

The type series shows variation in the propodeum, the sculpturing varying from rugose medially to feebly carinate and the lateral areas varying from finely carinate to granular. One male has considerable white hair on the clypeus.

This belongs to the *D. maura* (Ckll.) group but may be distinguished from related species in both sexes by the sculpturing of the propodeum and in the male by the peculiar leg development.

NEW OR INSUFFICIENTLY-KNOWN CRANE-FLIES FROM NEW CALEDONIA[1]

(Diptera: Tipulidae)

PART I

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The major island of New Caledonia, southernmost of the Melanesian Islands, lies in the Pacific Ocean about 875 miles east of Queensland, Australia. It has a length of 248 miles, with an average width of 31 miles, including an area of 8548 square miles, or slightly larger than Massachusetts.

The first crane-flies to be collected on New Caledonia were secured in 1928 by Professor and Mrs. T. D. A. Cockerell. A few scattered specimens were taken during the succeeding five years but the first important collection was one made by Dr. F. X. Williams in 1940 (Alexander, C. P. New or little-known Tipulidae from New Caledonia (Diptera). Proc. Hawaiian Ent. Soc., 12: 235–244; 1945). During the second World War many American troops were stationed on the island for varying periods of time and as a result of the interest of two entomologists, Mr. Charles F. Remington and Mr. John C. Herron, a large and representative series of the Tipulidae of the island became available. These were discussed in detail in a major paper that is still unpublished (Alexander, C. P. The crane-flies of New Caledonia (Diptera, Tipulidae). Trans. Royal Ent. Soc. London; in press). After this latter report was submitted for publication, still further specimens of these flies have become available, chiefly through the diligent efforts of Monsieur Louis R. Garrigou. Most of these latter specimens have been taken at relatively low altitudes on Mont Mou, in the southern part of the island, near Paita. I am very deeply indebted to Monsieur Garrigou for his appreciated efforts to make known the evidently rich Tipulid fauna of New Caledonia. All types of the novelties described at this time are preserved in my personal collection of these flies. A few further specimens are in the United States National Museum, collected by Mr. Wilfred Crabb, and sent to me for naming through the interest of Dr. Stone.

In the major paper above cited a total of 24 generic and subgeneric groups in the Tipulidae were recorded from New Caledonia. At this time I am adding six further generic and subgeneric groups, as follows (the asterisk indicates that the group is new to the island):

**Dolichopeza* Curtis.
Limonia Meigen; *subgenus *Discobola* Osten Sacken.
**Austrolimnophila* Alexander.
**Rhabdomastix* Skuse.
Erioptera Meigen; *subgenus *Meterioptera* Alexander.
**Toxorhina* Loew; *subgenus *Ceratocheilus* Wesche.

[1]Contribution from the Entomological Laboratory, University of Massachusetts.

It may be regarded as certain that intensive collecting will add further generic groups to the island list, as at present known. In the United States National Museum (Lot 42–3133) there is a specimen of *Conosia irrorata* (Wiedemann), labelled "New Zealand; New Caledonia?—in airplane. Honolulu No. 23,632." This widespread fly has not been recorded from New Caledonia, New Zealand or the Hawaiian Islands, yet is regional (Fiji; eastern Australia; New Guinea).

Genus **Phacelodocera** Enderlein

Phacelodocera margaritae Alexander

Phalacrocera margaritae Alexander; Trans. Royal Ent. Soc. London (in press).

Allotopotype, ♀, Mont Mou, New Caledonia, altitude 900 feet, April, 1947 (L. R. Garrigou).

Female.—Length about 33 mm.; wing 24 mm.; antenna about 5.5 mm.

Characters as in the male, differing in the structure of the antennae. Antennae 15-segmented; flagellar branches much shorter than in the male, the longest not exceeding three times the length of the segment; first flagellar segment with a single branch, subequal to the segment, placed beyond midlength; flagellar segments two to nine, inclusive, each with two basal branches but without the third branch of the male sex; branches slightly unequal, the outer about one-third to one-half longer than the inner and slightly stouter; outer four segments simple, or the first (flagellar segment ten) with a swelling or protuberance on outer face; terminal segment about one-half longer than the penultimate. Ovipositor with the valves elongate, the cerci very slender, much exceeding the hypovalvae.

Genus **Dolichopeza** Curtis

Dolichopeza (Dolichopeza) austrocaledonica sp. n.

General coloration of mesonotum yellowish brown with three darker brown praescutal stripes; anterior vertex narrow; wings with a brownish tinge, stigma oval, darker brown; Sc_1 preserved; *Rs* very short, lying far distad, beyond the level of the other elements of the anterior cord; *r-m* strongly arcuated; cell M_1 deep; *m-cu* about its own length before the fork of *M;* cell *2nd A* relatively broad; male hypopygium with the outer dististyle long and narrow, nearly five times as long as the greatest width.

Male.—Length, about 8 mm.; wing, 9 mm.; antenna (to end of segment seven) 4 mm.

Frontal prolongation of head dark brown; palpi black. Antennae relatively long, as shown by the measurements; scape, pedicel and first flagellar segment brownish yellow, the remainder of flagellum dark brown; flagellar segments long-cylindrical, with scattered unilaterally arranged verticils, the longest a trifle more than one-third the length of the segment; antennae broken at end of seventh segment. Head brown; anterior vertex relatively narrow, a little less than twice the diameter of the scape.

Pronotum brown. Mesonotal praescutum with the ground yellowish brown, with three darker brown stripes that are only a little darker

than the ground; scutum brownish yellow, the lobes patterned with brown; scutellum dark brown, parascutella paler; mediotergite paler yellowish brown, the pleurotergite still more yellowed. Pleura more yellowed dorsally, the ventral portion, also involving the posterior coxae, infuscated. Halteres with the stem pale, knob infuscated. Legs with the fore and middle coxae paler than the posterior pair; trochanters yellow; remainder of legs broken. Wings with a brownish tinge, cell *Sc* a trifle more yellowed; stigma oval, darker brown, occupying the space between *Rs* and vein R_2; veins brown. Venation: Sc_1 preserved, at the extreme tip of Sc_2; *Rs* very short, lying far distad and simulating a crossvein, lying just distad of the level of the tip of Sc_1; *r-m* strongly arcuated to subangulate at near midlength; cell M_1 deep, nearly three times its petiole; *m-cu* about its own length before the fork of *M;* cell *2nd A* relatively broad.

Abdomen feebly bicolored, the broad bases and apices of the individual segments dark brown, the intermediate part more reddish brown or yellow; subterminal segment more uniformly dark brown; hypopygium brownish yellow. Male hypopygium with the outer dististyle relatively long and slender, the length nearly five times the greatest width, the entire surface with relatively few long black setae. Inner dististyle with the beak a flattened pale blade, the tip obtuse; lower beak blackened, even broader and more obtuse.

Habitat: New Caledonia. Holotype, ♂, Mont Mou, altitude 900 feet, February, 1947 (Garrigou).

In its venation, particularly the distal position of *Rs*, the present fly is more like certain Papuan species of the subgenus, all of which have cell *2nd A* very narrow. In general appearance it somewhat resembles the Australian *Dolichopeza* (*Dolichopeza*) *longifurca* Skuse and *D.* (*D.*) *palliditarsis* Alexander, which differ in the venation and in the structure of the male hypopygium. The genus had not been recorded from New Caledonia.

Genus **Limonia** Meigen

Subgenus **Discobola** Osten Sacken

Limonia (Discobola) caledoniae sp. n.

Size large (wing, male, over 16 mm.); mesothorax chiefly black, the praescutum brownish yellow with four brownish black stripes on the posterior portion; both the femora and tibiae black with a subterminal yellow ring; wings brownish fulvous, patterned with darker brown and yellow, the latter chiefly as series of dots along the veins; costal fringe of short setae from small blackened tubercles; abdominal segments bicolored; male hypopygium with the tergite oval, its caudal border convex.

Male.—Length, about 13 mm.; wing, 16.5 mm.

Rostrum and palpi black. Antennae black, the pedicel a trifle more testaceous; flagellar segments long-oval. Head brownish black, sparsely pruinose; anterior vertex reduced to a narrow strip; head narrowed behind.

Cervical region blackened. Pronotum brown, variegated with brownish black, with a sparse yellow pollen. Mesonotal praescutum

obscure brownish yellow, with four brownish black stripes, the intermediate pair more intense, restricted to slightly more than the posterior half of the sclerite and only a little longer than the lateral stripes; anterior and lateral praescutal borders darkened; posterior sclerites of notum black, the centers of the scutal lobes vaguely more brightened; central portion of scutum and base of scutellum more brownish black, opaque; mediotergite paler at proximal end. Pleura black, the sternopleurite somewhat paler. Halteres black, the base of stem narrowly pale. Legs with the fore and middle coxae black, the tips narrowly yellow; posterior coxae with the outer half yellowed; trochanters obscure yellow; femora brown, the base slightly paler, apex and a subterminal ring narrowly yellow, enclosing a broader black anteapical annulus; tibiae brownish black with a narrow yellow subterminal ring, the blackened apex even narrower; tarsi brownish black; claws with a single tooth; setae of legs relatively short. Wings with a strong fulvous brown tinge, variegated with darker brown and yellow areas; the brown pattern includes large costal areas alternating with subequal yellow ones, the third dark mark ocelliform, at the fork of *Sc;* vein *Cu* with a brown seam in cell *M*, broken by yellow dots; remaining veins with series of yellow dots, at ends of veins R_3 to M_4, inclusive, appearing as delicate marginal semicircles; anterior prearcular field obscure yellow; veins brown, those in the anterior fields of the wing alternating with yellow sections in the brightened portions. Costal fringe of short setae from small blackened tubercles. Venation: Sc_1 ending shortly before the fork of *Rs*, Sc_2 near its tip; *Rs* strongly arcuated at origin; free tip of Sc_1 joining R_{1+2} at nearly a right angle; vein R_{4+5} deflected strongly caudad near tip, ending close to wing apex; cell *1st* M_2 elongate, irregular in outline, *m* being about one-third as long as the angulated basal section of M_3; *m-cu* shortly before fork of *M;* supernumerary crossvein in cell *1st A* gently sinuous, more than twice the distal section of vein *2nd A*.

Abdominal segments bicolored, the apical third of each dark brown or brownish black, the basal portion obscure yellow, becoming more brownish yellow on the outer segments; lateral borders of segments more narrowly darkened; hypopygium yellow. Male hypopygium with the tergite oval in outline, with both the caudal and cephalic borders convexly rounded. Basistyle with the ventromesal lobe large, applied to the entire mesal face of the style, near the outer end on lateral portion with a low secondary tubercle. Dorsal dististyle a very gently curved black rod, its tip acute. Ventral dististyle relatively small, without evident rostral spines. Gonapophyses appearing as double paired blades on either side of the slightly longer aedeagus, the inner blade more slender on its outer portion.

Habitat: New Caledonia. Holotype, ♂, Mont Mou, altitude 900 feet, June, 1947 (Garrigou).

Limonia* (*Discobola*) *caledoniae is entirely distinct from the more than 20 species of the subgenus so far made known. In some regards it suggests *L.* (*D.*) ***ampla*** (Hutton) and *L.* (*D.*) ***dohrni*** (Osten Sacken), of New Zealand, but the resemblance is not at all close. The subgenus had not been recorded from New Caledonia.

At this time I am re-naming a preoccupied species in this same subgenus: ***Limonia* (*Discobola*) *gibberina*** nom. nov.; for *L.* (*D.*) ***gibbera***

Edwards, 1923, of New Zealand; *nec L.* (*Dicranomyia*) *gibbera* Alexander, 1916. (*Discobola gibbera* Edwards; Trans. N. Z. Inst., 54: 286; 1923. *Dicronomyia gibbera* Alexander; Trans. Amer. Ent. Soc., *42:* 6–7; 1916.)

Genus **Helius** St. Fargeau

Helius (Helius) aphrophilus sp. n.

General coloration of thorax dark brown; rostrum unusually long, approximately one-third the remainder of body; legs black, the tarsi paler; wings with a faint grayish tinge, restrictedly patterned with brown.

Male.—Length, excluding rostrum, about 5.5–6 mm.; wing, 6–7 mm.; rostrum about 1.8–2 mm.

Female.—Length, excluding rostrum, about 7.5–8 mm.; rostrum about 2–2.2 mm.

Rostrum elongate, black throughout. Antennae black, short; basal flagellar segments oval, the outer ones passing through elongate-oval to cylindrical; verticils slightly longer than the segments. Head black; anterior vertex narrow, subequal to the diameter of scape.

Thorax almost uniformly dark brown; vestiture of praescutal interspaces elongate but scattered. Halteres infuscated, the extreme base of stem yellow. Legs with the coxae dark brown; trochanters a little paler; remainder of legs black, the tarsi paling to light brown or brownish yellow. Wings with a faint grayish tinge, restrictedly patterned with brown, as follows: A spot at origin of *Rs* and another more basad in cell *R* at near one-third the length of cell; stigma; very narrow seams over cord and outer end of cell *1st* M_2; tip of vein R_3; wing tip less evidently darkened; veins brown. Venation: *Sc* long, Sc_1 ending a short distance before fork of *Rs*, Sc_2 longer than Sc_1; *r-m* subequal to or a little longer than the basal section of R_{4+5}; cell *1st* M_2 small, pentagonal, much shorter than the veins beyond it; *m-cu* at or close to the fork of *M;* cell *2nd A* relatively wide.

Abdominal tergites dark brown; sternites brown with posterior borders obscure yellow; subterminal segments more uniformly pale; hypopygium with the basistyles obscure yellow, the remainder dark brown. Male hypopygium with the basistyle unarmed. Outer dististyle relatively short and straight, the tip very indistinctly bifid. Inner dististyle longer, stout, the outer fourth somewhat more narrowed, the outer margin with several strong tubercles that bear strong setae. Gonapophyses with the lower apical angle extended into a long straight spine.

Habitat: New Caledonia. Holotype, ♂, Mont Mou, altitude 900 feet, December, 1946 (Garrigou). Allotopotype, ♀, pinned with type. Paratypotypes, several ♂♂, December, 1946, to March, 1947 (Garrigou); paratypes, ♂♀, St. Louis, altitude 1100 feet, December 2–30, 1945 (Herron), hanging on under faces of wet rocks in cascades and rapids of stream and on stones near waterfalls; ♂♀, near La Foa, February 26–April 25, 1945 (Remington).

The only other regional species having the rostrum elongate is *Helius* (*Helius*) *neocaledonicus* Alexander, which is readily told by the

larger size and the unpatterned wings. The present fly seems to prefer wet boulders near waterfalls and rapids, whence the specific name.

Genus **Austrolimnophila** Alexander

Austrolimnophila garrigoui sp. n.

General coloration brownish black, patterned with yellow; legs black, both the femora and tibiae very narrowly ringed with yellowish white, the tarsi paling to obscure yellow; wings strongly infuscated, with a conspicuous pattern of still darker brown, these latter areas bordered by cream-yellow; *Rs* square and short-spurred at origin; *m-cu* at near two-thirds the length of cell *1st* M_2; abdomen brownish black, the segments ringed posteriorly with pale.

Female.—Length, about 9 mm.; wing, 9.5 mm.

Rostrum brownish black; palpi black. Antennae (female) short; scape and pedicel black, the former pruinose; basal three flagellar segments yellow, the remainder black; flagellar segments becoming long-cylindrical, with elongate verticils that exceed the segments. Head brown, more or less yellow pollinose.

Pronotum brown, somewhat darker on the sides. Mesonotal praescutum black with two intermediate light brown stripes that are separated by a shiny black capillary vitta, the sublateral stripes and lateral border blackened; scutum light brown, each lobe variegated with brownish black spots; scutellum blackened basally, more pruinose on posterior border; postnotum black, heavily gray pruinose; a capillary dark central vitta on the mediotergite. Pleura and pleurotergite with the ground obscure brownish yellow, conspicuously patterned with black, including a complete dorsal stripe, the broad bentral sternopleurite, and a broken intermediate stripe appearing on the dorsal sternopleurite and again on the ventral pleurotergite. Halteres long and slender, dusky, the base of stem and apex of knob whitened. Legs with the coxae black, more or less pruinose basally, the tips whitened; fore coxae with the extreme base again black; trochanters brownish yellow; femora black, obscure yellow basally, with three narrow rings of yellowish white, these rings at near one-third, two-thirds and the tip, respectively; tibiae black, similarly with three narrow yellowish white rings, involving the base and tip and a similar annulus at near one-fifth the length; tarsi brownish black, paling into obscure brownish yellow. Wings with the ground strongly infuscated, with a conspicuous pattern of darker brown, all these areas ringed with cream-yellow to produce a handsome pattern; the dark marks include four in the prearcular field; at arculus, extending anteriorly to *C;* origin of *Rs*, extending from *C* almost to *M;* a band at cord, extending from *C* back to *M*, more narrowed behind; seams over outer end of cell *1st* M_2, *m-cu*, R_2, fork of M_{1+2}, and at ends of all longitudinal veins; two further dark areas in cell *2nd A*, at base and at near midlength; veins yellow in the brightest fields, elsewhere becoming brownish yellow and finally dark brown in the patterned portions. Venation: *Rs* square and short-spurred at origin; R_{2+3+4} about one-half longer than the basal section of R_5; R_{1+2} about three times R_2; cell M_1 nearly twice its petiole; *m-cu* at near two-thirds the length of cell *1st* M_2.

Abdomen brownish black, the posterior borders of the segments ringed with pale, very narrowly so on the tergites, more broadly so on the sternites. Genital shield black, valves of ovipositor horn-yellow.

Habitat: New Caledonia. Holotype, ♀, Mont Mou, altitude 900 feet, February, 1947 (Garrigou).

This beautiful and exceptionally distinct crane-fly is named for the collector, Louis Robert Garrigou, who has added materially to our knowledge of the Tipulidae of New Caledonia. Superficially the fly suggests certain species of *Epiphragma* in Tropical America, while being quite dissimilar to the two species of this latter genus so far discovered in New Caledonia. There is no trace of the supernumerary crossvein in cell *C*, characteristic of all species of *Epiphragma*. The genus *Austrolimnophila* is new to the island list.

Genus **Gynoplistia** Westwood

Gynoplistia (Paralimnophila) neocaledonica Alexander

Gynoplistia (Paralimnophila) neocaledonica Alexander; Proc. Hawaiian Ent. Soc., 12: 240–242, figs. 4, 8; 1945.

2 ♀♀, Mont Mou, New Caledonia, altitude 900 feet, March, 1947 (Garrigou).

Gynoplistia (Paralimnophila) caledonica sp. n.

Mesonotal praescutum fulvous in front, brown behind, the surface more or less pruinose; antennal flagellum brownish yellow; femora yellow, with two narrow dark brown rings, both subterminal; tibiae yellow, the apex narrowly brownish black; wings whitish subhyaline, restrictedly patterned with medium brown, the areas restricted to the vicinity of the veins; cell R_3 sessile or very short-petiolate.

Male.—Length, about 12 mm.; wing, 10.5 mm.

Rostrum dark gray; palpi brownish black; labial palpi obscure orange. Antennae with the scape brown, sparsely pruinose; pedicel paler brown; flagellum brownish yellow, the segments subcylindrical, slightly longer than the verticils. Head dark, heavily gray pruinose, the center of the posterior vertex and the occiput with a brown median spot.

Pronotum light brown, sparsely gray pruinose; pretergites pale yellow. Mesonotal praescutum in front fulvous, behind brown, more or less pruinose and patterned with still darker brown stripes, including a median vitta that is even more blackened and continues to the cephalic border of the sclerite; scutum infuscated; scutellum testaceous brown with a darker median vitta; mediotergite light gray, with a narrow more blackened central stripe; pleurotergite gray. Pleura yellow, including the dorsopleural membrane. Halteres uniformly yellow. Legs with the coxae pale yellow, sparsely pruinose; trochanters yellow; femora yellow, with two narrow dark brown rings, one nearly terminal, the other subapical, the two annuli separated by a much broader ground ring; tibiae yellow, the tips narrowly brownish black; tarsi yellow. Wings whitish subhyaline, restrictedly patterned with medium brown, as follows: A spot at origin of *Rs*, with a second larger area in transverse alignment in cells *Cu* and *1st A;* a more basal spot in cell *R;* stigma and a complete seam crossing the wing, the stigma slightly darker; outer end of cell

1st M_2; spots at fork of M_{1+2} and tips of veins R_2 and R_4; veins yellow, darker in the clouded portions. Venation: *Sc* moderately long, Sc_1 ending shortly before the fork of *Rs*, Sc_2 a short distance before the tip; *Rs* elongate, exceeding its anterior branch, cell R_2 sessile or very short-petiolate; vein R_{2+3+4} and basal section of R_5 interstitial or virtually so; *r-m* short or obliterated by fusion of veins R_5 and M_{1+2}; cell *1st* M_2 rectangular; cell M_1 subequal to or a little shorter than its petiole; *m-cu* about one-fourth its length beyond the fork of *M*.

Basal abdominal tergite brownish black medially, the margins yellow; succeeding tergites obscure yellow; a subterminal brownish black ring; hypopygium and preceding segment yellow. Male hypopygium with the tergite narrowed outwardly, its caudal margin very gently emarginate. Outer dististyle slender; inner style more or less mitten-shaped, the tip obtuse.

Habitat: New Caledonia. Holotype, ♂, Mont Mou, altitude 900 feet, April, 1947 (Garrigou).

Most similar to *Gynoplistia* (*Paralimnophila*) *neocaledonica* Alexander, differing conspicuously in the coloration of the antennae, legs and wings and in the venation.

Gynoplistia (Gynoplistia) williamsiana Alexander

Gynoplistia (*Gynoplistia*) *williamsiana* Alexander; Proc. Hawaiian Ent. Soc., 12: 242–243, figs. 5, 9; 1945.

This is apparently the commonest and most widely distributed member of the genus in New Caledonia. Conception, November 8–11, 1944; Dumbea, October 14–29, 1944; Noumea, September 10, 1944 (all Wilfred Crabb); United States National Museum. Mont Mou, altitude 900 feet, June, 1947 (Garrigou).

Genus **Rhabdomastix** Skuse

Rhabdomastix austrocaledoniensis sp. n.

Size very small (wing under 3.5 mm.); mesonotal praescutum and scutum brownish yellow, heavily gray pruinose, the posterior sclerites and the pleura clearer yellow; legs brown; wings with a light grayish tinge, veins pale brownish yellow; no macrotrichia on *Rs* or its anterior branch; Sc_1 ending about opposite three-fifths the length of *Rs;* distance on costa between R_{1+2} and R_2 subequal in length to the latter vein; cell *1st* M_2 small.

Sex? Length, about 2.7–2.8 mm.; wing, 3–3.3 mm.

Specimens damaged by Corrodentia. Head brownish yellow. Mesonotal praescutum and scutum brownish yellow, heavily light gray pruinose; scutellum and postnotum clearer yellow; lateral border of praescutum and the pretergites yellow. Pleura yellow, in cases weakly more infuscated. Legs with the coxae and trochanters yellow; remainder of legs brown. Wings with a light gray tinge, the costal border a trifle more yellowed; veins pale brownish yellow. No macrotrichia on *Rs* or its anterior branch; relatively abundant coarse trichia on R_5, excepting its base, and on distal ends of outer sections of veins M_{1+2} and M_3. Venation: Sc_1 ending about opposite three-fifths the length of *Rs;*

R_{2+3+4} about three times the slightly oblique to suberect vein R_3; distance on costa between R_{1+2} and R_3 subequal in length to the latter vein; distal section of vein M_{1+2} gently arcuated at its base; cell *1st* M_2 small, about one-third as long as the distal section of vein M_{1+2}; *m-cu* at near one-third the length of cell *1st* M_2.

Habitat: New Caledonia. Holotype, Sex?, Mont Mou, altitude 1100 feet, June, 1947 (Garrigou). Paratopotypes, 2 fragmentary specimens.

Rhabdomastix austrocaledoniensis is quite distinct from the relatively numerous species of the genus now known from Australia and New Zealand, being distinguished by the unusually small size and by the venation and trichiation of the wings. This widespread genus had not hitherto been recorded from New Caledonia.

Genus **Erioptera** Meigen

Subgenus **Meterioptera** Alexander

Erioptera (Meterioptera) caledonia sp. n.

Thorax brownish yellow, the pleura clearer yellow; basal fusion of flagellar segments apparently involving two segments; legs yellow, the outer tarsal segments blackened; wings grayish yellow; Sc_1 very long, nearly equal to *Rs;* R_{2+3+4} and R_{2+3} in oblique alignment; vein *2nd A* very strongly sinuous on its outer fourth.

Male.—Length, about 3.5 mm.; wing, 3.5–3.7 mm.

Female.—Length, about 4 mm.; wing, 4–4.2 mm.

Rostrum yellow; palpi brownish black. Antennae with the scape, pedicel and basal flagellar segments yellow, the outer ones slightly darker; basal fusion of flagellar segments apparently involving two articles, the remaining ones oval, with long conspicuous verticils. Head obscure yellow.

Thorax brownish yellow, the pretergites and pleura clearer yellow. Halteres with stem yellow, knob weakly darkened. Legs with all coxae and trochanters yellow; remainder of legs yellow, the outer tarsal segments black. Wings grayish yellow, the prearcular and costal fields pale yellow; veins yellow, those comprising the cord slightly darker yellowish brown. Venation: Sc_1 ending opposite the fork of *Rs*, Sc_2 only a short distance beyond the origin of *Rs*, Sc_1 thus very long, nearly equal to *Rs*, the latter long; R_{2+3+4} in alignment with R_{2+3}, both oblique; *m-cu* just before the fork of *M;* vein *2nd A* with the outer fourth strongly sinuous, running close to the wing margin.

Abdominal tergites brown, the sternites and genital segment more yellowed.

Habitat: New Caledonia. Holotype, ♀, Mont Mou, altitude 900 feet, February, 1947 (Garrigou). Paratopotypes, several ♂♀, February–June, 1947 (Garrigou).

The present fly is most similar to Australian species, such as *Erioptera (Meterioptera) illingworthi* Alexander, differing in the small size, and in the details of coloration and venation. The subgenus *Meterioptera* is new to the island list.

Genus **Molophilus** Curtis

Molophilus (Molophilus) vorax sp. n.

Belongs to the *gracilis* group and subgroup; general coloration dark brown; antennae short; wings with a weak dusky tinge; costal fringe (male) long and conspicuous; male hypopygium with the basistyle terminating in three lobes, the dorsal one a slender spine; outer dististyle a strongly sinuous rod; inner style more flattened, nearly parallel-sided, its lower apical angle produced into an acute blackened spine.

Male.—Length, about 3 mm.; wing, 3.5 mm.

Rostrum and palpi dark brown. Antennae (male) short, if bent backward not attaining the wing root; scape pale, the remainder of organ dark brown; flagellar segments subcylindrical, with truncated ends, shorter than the longest verticils. Head dark brown.

Thorax almost uniformly dark brown, the sides of the praescutum and the pleura a trifle paler. Halteres with the stem darkened, narrowly pale at base, knob broken. Legs brownish yellow, with dark vestiture, the outer tarsal segments more darkened. Wings with a weak dusky tinge, the veins and macrotrichia darker brown. Costal fringe (male) long and conspicuous. Venation: R_2 lying shortly distad of level of *r-m;* petiole of cell M_3 a little more than twice the straight *m-cu.*

Abdomen, including hypopygium, dark brown or brownish black. Male hypopygium with the mesal and ventral apical lobes of the basistyle fleshy, setiferous, the dorsal one a slender spine of nearly the same length. Two dististyles occupying the notch of the basistyle, the outer a strongly sinuous or sigmoid rod, its base thickened, the outer half or more extended into an elongate black spine. Inner dististyle a flattened parallel-sided rod, the lower apical angle produced into an acute blackened spine, the upper apical portion with microscopic appressed spinulae. Aedeagus stout at base, narrowed very gradually to the slender tip.

Habitat: New Caledonia. Holotype, ♂, Mont Mou, altitude 900 feet, February, 1947 (Garrigou). Paratopotype, ♂, on slide, March, 1947 (Garrigou).

The only other regional member of the group is *Molophilus* (*Molophilus*) *tartarus* Alexander, which has the male hypopygium entirely different in structure.

Genus **Toxorhina** Loew

Subgenus **Ceratocheilus** Wesche

Toxorhina (Ceratocheilus) caledonica sp. n.

Rostrum very long, much exceeding the wing; disk of mesonotum dark brown, the cephalic and lateral portions of the praescutum yellow; pleura yellow, striped longitudinally with brownish black; halteres yellow; legs dark brown; wings weakly tinged with brown, restrictedly patterned with darker brown, appearing as seams along the cord and elsewhere; anterior branch of *Rs* sinuous, relatively long; cell *1st* M_2 closed; abdominal tergites bicolored, dark brown, with a narrow obscure yellow crossband at near midlength of each.

Female.—Length, excluding rostrum, about 9 mm.; wing, 6 mm.; rostrum, about 8.3 mm.

Rostrum unusually long, as shown by the measurements, much exceeding the wing, black throughout. Antennae with the scape dark; remainder of organ broken. Head yellowish gray; anterior vertex without corniculus, relatively narrow, less than the diameter of the rostrum; setae of vertex relatively numerous and strong, chiefly proclinate.

Cervical region and pronotum brownish black. Mesonotal praescutum projecting strongly over the pronotum, the cephalic and lateral portions yellow, contrasting abruptly with the remainder of disk which is dark brown; posterior sclerites of notum similarly darkened, sparsely pruinose. Pleura whitish yellow, striped longitudinally with brownish black, the broadest and most conspicuous stripe dorsal in position, extending from the pronotum across the dorsal pleurites to the abdomen, passing through the root of the halteres; ventral sternopleurite less heavily infuscated. Halteres pale yellow. Legs with the coxae whitish yellow; trochanters brown; remainder of legs dark brown, the tarsi not or scarcely brightened. Wings with a weak brownish suffusion, the prearcular and basal costal area somewhat more yellowed; a relatively conspicuous brown pattern, appearing as seams to *Rs*, cord, anterior branch of *Rs*, base of outer section of vein R_5 and as a seam along *Cu*, chiefly in cell *M;* cells *C* and *Sc* more brownish yellow; veins brown, paler at wing base. Macrotrichia on outer radial and medial veins, sparse or lacking on M_4. Venation: Sc_1 ending about opposite one-third the length of *Rs*, Sc_2 nearly opposite the origin; *Rs* more strongly arcuated than in most other regional species; anterior branch of *Rs* sinuous, relatively long; cell *1st* M_2 closed, shorter than M_4; *m-cu* at or just beyond the fork of *M;* cell *2nd A* relatively wide.

Abdomen with the tergites bicolored, dark brown, with a relatively narrow obscure yellow transverse band at near midlength, both base and apex darkened; sternites more uniformly pale yellow, the posterior borders narrowly margined with dark brown. Ovipositor with the genital shield dark brown; valves of ovipositor dark chestnut brown, very long, especially the slender nearly straight cerci.

Habitat: New Caledonia. Holotype, ♀, Mont Mou, altitude 900 feet, March, 1947 (Garrigou).

A very distinct species, readily told from others in New Guinea, Australia and New Zealand by the coloration of the body and wings. It is entirely different from the species next described. In its venation it is most like species such as *Toxorhina* (*Ceratocheilus*) *australasiae* Alexander but very distinct. Both the genus and subgenus were unrecorded from New Caledonia.

Toxorhina (Ceratocheilus) juvenca sp. n.

Mesonotum light brown, the posterior sclerites gray; head light gray; legs brown, with black vestiture; wings with a weak brownish tinge, unpatterned; *Rs* and basal section of vein R_5 subequal in length; anterior branch of *Rs* longitudinal in position, sinuous, about twice as long as *Rs;* cell *2nd A* very narrow.

Sex? Length, excluding rostrum, about 4.5 mm.; wing, 4 mm.; rostrum, about 4.2 mm.

Rostrum brown throughout, exceeding the wing in length. Antennae with the scape and pedicel yellow; flagellum broken. Head light gray; no corniculus; anterior vertex relatively broad, approximately four times the diameter of scape.

Pronotum fulvous yellow. Mesonotum light brown, paling to fulvous at the produced cephalic end, the lateral praescutal borders pale; scutal lobes light brown, the remainder of mesonotum gray; posterior margin of scutellum and lateral portion of mediotergite brown. Pleura brownish gray, the sternopleurite somewhat paler. Halteres with stem brown; knob broken. Legs with the coxae and trochanters light yellow; trochanters testaceous yellow; remainder of legs brown, with black vestiture. Wings with a weak brown tinge, unpatterned; veins dark brown. Venation: *Sc* short, Sc_1 ending about opposite one-fourth to one-fifth the length of *Rs*, Sc_2 opposite this origin; *Rs* subequal in length to basal section of R_5 and only about one-half as long as its anterior branch, the latter longitudinal in position, sinuous; distance on costa between the tips of veins R_{1+2} and R_3 slightly greater than the length of *Rs* alone; cell *1st* M_2 subrectangular, M_{3+4} subequal to vein M_4; *m-cu* shortly before the fork of *M;* cell *2nd A* very narrow, striplike.

Abdomen with basal segments brown, bordered by dark brown; outer segments broken.

Habitat: New Caledonia. Holotype, Sex? Mont Mou, altitude 900 feet, April, 1947 (Garrigou).

The present fly is readily told from the only other regional member of the genus and subgenus, *Toxorhina* (*Ceratocheilus*) *caledonica* sp. n., by the small size and unpatterned wings, with all venational details distinct.

THE ENTOMOLOGICAL SOCIETY OF AMERICA

PROCEEDINGS OF THE FORTY-SECOND ANNUAL MEETING

Chicago, Illinois, December 27-30, 1947

The Entomological Society of America held its forty-second annual meeting Saturday through Tuesday, December 27–30, 1947, in conjunction with the annual meeting of the American Association of Economic Entomologists and the American Association for the Advancement of Science. Headquarters for the Entomological meetings were in the Congress Hotel. Attendance for the two Entomological meetings was almost 500 and about 400 attended the Entomologists' Banquet.

The program presented at the four-day meeting follows:

Saturday Morning, December 27, 10:00 A. M.

Registration of entomologists at entrance of Florentine Room.

Saturday Afternoon, December 27, 1:30 P. M.

JOINT SESSION WITH TEACHING SECTION OF THE AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

Dr. Alvah Peterson presided at the session and introduced President Metcalf, who announced the appointment of the following committees:

Nominating Committee—Al Boyce, R. E. Traub, H. B. Hungerford, Chairman.

Resolutions Committee—B. D. Burks, F. A. Fenton, C. W. Sabrosky, Chairman.

The following program was presented:

What Constitutes Good Training in Entomology.
- For the New Fields of Entomology.....C. W. KEARNS
- For Teachers.....C. E. MICKEL
- For Regulatory and Quarantine Service.....E. R. SASSCER
- Open Discussion: Should a Standard for Training be Formulated? Leader, R. C. SMITH

Methods of Teaching.
- Insect Toxicology.....W. M. HOSKINS
- Apiculture.....V. G. MILUM
- Adult Taxonomy.....H. E. JACQUES
- Larval Taxonomy.....ALVAH PETERSON

The Relationship between Teaching Loads and Experiment Station Work in Entomology.....DWIGHT ISELY

The Professional Placement of Entomology Graduate Students, J. T. CREIGHTON

Sunday Morning, December 28

10:00 A. M.—JOINT MEETING WITH AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

President Metcalf called the meeting to order and introduced

Dr. E. N. Cory, President of the American Association of Economic Entomologists, who delivered his Presidential Address.

At the end of this joint session, the two Societies met separately for the remainder of the morning.

11:00 A. M.—GENERAL SESSION: EXPLANATION OF EXHIBITS

President Metcalf opened the meeting, which consisted of an explanation of the various exhibits on display.

1. Microbiological assay technique for the determination of vitamin and amino acid content of insect tissues. HENRY DEVLIN THOMAS, North Park College.
2. A new method of rearing *Drosophila*. A. C. HODSON and H. C. CHIANG, University of Minnesota.
3. Material for larval studies. ALVAH PETERSON, Ohio State University.
4. A convenient and satisfactory storage system for student reference collections. R. L. POST, North Dakota State College.
5. Entomological illustrations with the aid of a substage lamp and projection prism. R. L. POST, North Dakota State College.
6. Equipment for using cockroaches in quantitative physiological studies. JERRE L. NOLAND and J. H. LILLY, University of Wisconsin.

Description of the exhibits followed. The exhibits were extremely interesting and were left in place until Tuesday afternoon.

Sunday Afternoon, December 28, 1:30 P. M.

GENERAL SESSION

PRESIDENT METCALF, *Presiding*

1. Entomological courses offered by United States colleges and universities. (10 min.) P. C. STONE, University of Missouri.
2. A dust proof filing system for entomological publications (6 min.). J. ALEX MUNRO, North Dakota State College.
3. A preliminary report on insects of Bikini Atoll (10 min.). A. C. COLE, JR., University of Tennessee.
4. Psychodidae Genitalia: terminology and study techniques (7 min., illus.). WILLIAM F. RAPP, JR., Doane College.
5. Immature stages and biology of the mosquito, *Megarhinus septentrionalis* D. & K. (15 min., illus.). OSMOND P. BRELAND, University of Texas.
6. Terminology of braconid wings (10 min., illus.). GARLAND T. RIEGEL, University of Illinois.
7. Breeding of *Aedes sollictans* in abandoned rice fields in South Louisiana (15 min., illus.). E. S. HATHAWAY, Tulane University.
8. Recent investigations on the relationship of fruit flies infesting cherries in the West (10–15 min., illus.). S. C. JONES, Oregon State College.
9. Adaptations in fleas, with special reference to the aedeagus (15 min., illus.). MAJOR ROBERT TRAUB, U. S. Army.
10. Larval and pupal characters in *Physonota* (Chrysomelidae) (5 min., illus.). MILTON W. SANDERSON, Illinois Natural History Survey.
11. Biological requirements for rearing cat fleas in the laboratory. WILLIS N. BRUCE, Illinois Natural History Survey.
12. Equipment for using cockroaches in quantitative physiological studies. JERRE L. NOLAND and J. H. LILLY, University of Wisconsin.

Sunday Evening, December 28, 6:30 P. M.

The Entomological Banquet was held in the Casino with Dr. Harlow B. Mills as toastmaster. At the end of the banquet, Dr. R. L. Patton gave a very interesting talk on "The Application of Radio-Active Elements to Entomology."

Monday Afternoon, December 29, 1:00 P. M.

PHYSIOLOGY SESSION

J. FRANKLIN YEAGER, *Presiding*

1. Insect vision; a review (15 min., illus.). L. J. MILNE, University of New Hampshire.
2. The effect of temperature on the hatching of eggs of the northern walking stick (15 min., illus.). A. C. HODSON, University of Minnesota.
3. Plant hormones (auxins) as a factor in the hatching of *Aedes trivittatus* (Coquillett) eggs (10 min., illus.). ALBERT ABDEL-MALEK, Ohio State University.
4. Chemically induced transformations of organ systems in insects (15 min., illus.). DIETRICH BODENSTEIN, Medical Research Laboratory, Edgewood Arsenal, Maryland.
5. The endocrinology of diapause in the *Cecropia* silkworm (15 min., illus.). CARROLL M. WILLIAMS, Harvard University.
6. Qualitative analysis of amino acids in insect blood (15 min., illus.). JOHN J. PRATT, JR., Cornell University.
7. The microbiological assay of *Notonecta* spp. (and other insects): quantitative determination of amina acid and vitamin content by use of Lactobacillus spp. (10 min., illus.). HENRY DEVLIN THOMAS, North Park College.
8. Physiology of tracheal filling in *Sciara* (10 min., illus.). MARGARET L. KEISTER, National Institute of Health.
9. Respiration of *Phormia* in relation to DDT (10 min., illus.). JOHN B. BUCK and MARGARET L. KEISTER, National Institute of Health.
10. A study of certain metabolic intermediates in the DDT poisoned housefly adult (15 min., illus.). PAUL A. DAHM, Kansas State College.
11. The metabolic fate of DDT in the milkweed bug (10 min., illus.). WILLIAM C. FERGUSON, Pittsburgh Plate Glass Company.
12. The influence of Ryania extract on the metabolism of the cockroach (10 min., illus.). G. A. EDWARDS, K. D. ROEDER, and ELIZABETH WEIANT, Tufts College.
13. The temperature coefficients of DDT action (15 min., illus.). H. Y. FAN, T. H. CHENG and A. G. RICHARDS, University of Minnesota.
14. Synopses in the insect nervous system (15 min., illus.). KENNETH D. ROEDER, Tufts College.
15. A ratio hypothesis pertaining to the biological action of poisons and drugs (10 min., illus.). J. FRANKLIN YEAGER, U. S. D. A., B. E. P. Q., and SAM C. MUNSON, George Washington University.
16. Relationships between time lags and responses to temperature (15 min., illus.). NELLIE M. PAYNE, American Cyanamid Company, Stamford, Connecticut.
17. The action of DDT upon lipoidal films, W. M. HOSKINS and A. Z. FATHY.
18. Respiratory studies on homogenized insect tissues by means of the Warburg apparatus. (by title). ELSIE L. COLE, University of Wisconsin.

TAXONOMY SESSION

E. GORTON LINSLEY, *Presiding*

1. Static vs. dynamic nomenclature (15 min., illus.). Z. P. METCALF, North Carolina State College.
2. On citing distribution of North American Insects (10 min., illus.). J. C. BRADLEY, Cornell University.
3. Considerations on the spider genus *Dictyna* Sundevall (10 min.). SARAH E. JONES, Texas State College for Women.
4. The genus *Cymatia* (Corixidae-Hemiptera) (7 min., illus.). H. B. HUNGERFORD, University of Kansas.
5. The nomenclature of the orders of the Apterygota (15 min.). CHARLES L. REMINGTON, Harvard University.
6. Description of the larvae of some ruteline beetles with keys to tribes and genera (Scarabaeidae) (10 min., illus.). PAUL O. RICHTER, University of Kentucky.
7. Genitalic differences in the sawfly genus *Periclista* (Tenthredinidae) (10 min., illus.). LEWIS J. STANNARD, Illinois Natural History Survey.
8. Whither nomenclature? (15 min.). CURTIS W. SABROSKY, U. S. D. A., B. E. P. Q.

Monday Evening, December 29, 8:00 P. M.

ANNUAL PUBLIC ADDRESS

The Annual Public Address of the Entomological Society of America, by Dr. Alfred E. Emerson, University of Chicago, was on the subject, "Zoogeography of Termites."

Dr. Emerson illustrated his excellent address with a zoogeographic presentation of the known distribution of the various termite groups.

Tuesday Morning, December 30, 9:00 A. M.

JOINT SESSION WITH THE ECOLOGICAL SOCIETY OF AMERICA

ORLANDO PARK, *Presiding*

1. A notable aggregation of Collembola (by title). ORLANDO PARK, Northwestern University.
2. Observations upon the ecology of the Phalangida of the Chicago area (10 min., illus.). MARIE V. O'BRIEN, Chicago, Illinois.
3. A preliminary analysis of the response of centipedes to differential amounts of moisture (15 min., illus.). STANLEY I. AUERBACH, Northwestern University.
4. The effect of different relative humidities on the development of the horned Passalus (15 min., illus.). I. E. GRAY, Duke University.
5. Modal temperatures of the greenhouse whitefly *Trialeurodes vaporariorum* and its parasite *Encarsia formosa* (10 min., illus.). THOMAS BURNETT.
6. Some relations of aqautic insects to plants of the genus *Potamogeton* (15 min., illus.). CLIFFORD O. BERG, University of Michigan.
7. A biologically annotated list of the Buprestidae of the lower Rio Grande Valley, Texas (15 min., illus.). GEORGE R. VOGT, Pharr, Texas.
8. The zoogeography of American Conopisthinae (Araneida: Ther.) (10 min.). HARRIETT E. FRIZZELL, University of Texas.
9. Comparative population studies of the long-tailed mealybug and its natural enemies on citrus (15 min., illus.). PAUL DE BACH, University of California.
10. The seasonal occurrence of mayflies (Ephemeroptera) (12 min., illus.). JUSTIN W. LEONARD, University of Michigan.
11. Notes on the distribution and ecology of the pseudoscorpions of Illinois (10 min., illus.). C. CLAYTON HOFF, University of New Mexico.
12. Ecology of the chiggers affecting man in the United States (Acarina, Trombiculidae) (15 min., illus.). DALE W. JENKINS, Army Chemical Center, Edgewood, Maryland.

Tuesday Afternoon, December 30, 1:30 P. M.

BUSINESS MEETING

President Metcalf called the meeting to order and asked for the report of the Secretary.

REPORT OF THE SECRETARY

Executive Committee Activities:

PRESIDENT METCALF nominated Mr. C. F. W. MUESEBECK for membership on the Organizing Committee for the Congress of Tropical Medicine, to represent the Entomological Society of America.

On March 26, PRESIDENT METCALF appointed PROFESSOR R. W. HARNED as a representative of the Society to the organizing board of the American Institute of Biological Sciences.

On May 16, the Secretary served as delegate of the Society at the installation of GEORGE DINSMORE STODDARD as president of the University of Illinois.

Twenty-four new members were elected to membership in the Society by mail ballot of the Executive Committee.

Annual Executive Committee Meeting:

Convened on the evening of December 27 at 7:30, in joint session with the Executive Committee of the Association of American Economic Entomologists. Most of the material discussed was referred to later separate discussion. One item was agreed upon at that time, that the committee would recommend following the outline of meeting places adopted last year. The next meeting is therefore planned for New York City during the second week of December.

After this the Executive Committee continued with Society business.

1. Thirty-three new members were elected as new members of the Society.

2. The following members have resigned during the year: OTTO ACKERMAN, W. C. ALLEE, LAWRENCE M. BARTLETT, R. A. BLANCHARD, CLYDE A. DENNIS, LORIN ROY GILLOGLY, ANITA HOFFMAN, JOHN M. HUTZEL, H. R. JENNINGS, E. T. JONES, S. MARCOVITCH, ARTHUR C. MASON, J. R. PARKER, FRANK M. SEMANS, SEPTIMA C. SMITH, J. S. STANFORD, I. B. TARSHIS, ROY T. WEBBER, R. W. WELLS, and HARLEY F. WILSON. The following members have been dropped from membership because of failure to pay dues or because they cannot be reached: PAUL ANDUZE, WM. R. COBB, J. P. KISLANKO, JEAN PAUL PICARD, MERRILL K. RILEY, PHILIP SCHROEDER, J. K. G. SILVEY, VICENTE VELASCO.

3. The following were elected as Fellows of the Society: FLOYD ANDRE, RICHARD BOHART, MELVIN GRIFFITH, M. H. HAYDAK, W. M. HOSKINS, CLYDE KEARNS, A. B. KLOTS, JOHN T. MEDLER, L. J. MILNE, E. S. ROSS, H. RUCKES, R. G. SCHMIEDER, O. E. TAUBER, and WM. TRAGER.

4. The Society has suffered the loss by death of the following nine members: T. D. A. COCKERELL, R. W. GLASER, V. R. HABER, J. S. HOUSER, W. S. MARSHALL, W. N. NUSHAWG, PHILIP A. READIO, A. G. RUGGLES, FRANKLIN SHERMAN, and H. H. WHALL.

5. The following were elected to fill the three vacancies of the Editorial Board: C. W. SABROSKY, M. W. SANDERSON, and C. D. MICHENER.

6. To fill the two vacancies in the Thomas Say Foundation for a period of two years, C. F. W. MUESEBECK and HERBERT H. ROSS were renominated and elected.

7. It was voted to contribute $100.00 to the support of Zoological Record.

8. It was voted to assist the American Society of Naturalists with the financing of the Biologists' Smoker, as indicated in correspondence between WILSON S. STONE, Section of the ASN, and the Secretary of the Entomological Society.

9. Nominations of the American Committee on Entomological Nomenclature were confirmed, naming P. W. OMAN, C. D. MICHENER, and C. S. WALLEY, to fill three vacancies now existing in that Committee.

10. Recommendations were made on reports of the Committee on Insect Physiology and the Joint Committee on History. These will be given at the time of presentation of these reports.

Respectfully submitted,

HERBERT H. ROSS, *Secretary*.

TREASURER'S REPORT

DECEMBER 2, 1946, TO DECEMBER 22, 1947

CURRENT FUND

Balance on hand December 2, 1946	$2,357.09
Receipts	7,078.17
Total	$9,435.26

EXPENDITURES

Annals (five numbers)	$7,054.84
Expenses of the Secretary-Treasurer's office, including costs of Richmond meeting	282.85
Travel expense	135.85
Checks returned and bank charges	27.01
To Zoological Society of London for Zoological Record	100.05
To International Commission of Zoological Nomenclature	50.05
To American Committee of Entomological Nomenclature	33.03
Total	$7,683.68

PERMANENT FUND

Balance as of December 2, 1946	$4,596.23
Interest and Bond coupons	16.44
Liberty Bond	50.00
Total	$4,662.67

TOTAL RESOURCES OF SOCIETY

Balance in Current Fund	$1,751.58
Balance in Permanent Fund	4,662.67
Total	$6,414.25

Respectfully submitted,

HERBERT H. ROSS, *Treasurer.*

It was moved and seconded that the Treasurer's report be adopted as read, subject to the approval of the auditing Committee. Motion carried.

REPORT OF THE MANAGING EDITOR

During the past year the amount of material received for publication in the Annals has been approximately what we could publish in a volume of reasonable size, hence there has been little opportunity to select and diversify the contents of the issues and the December issue will contain an unusual number of short articles. Since it was prepared for the press, with a rather meager amount of copy available, a rather large number of manuscripts have been received to give us a good start for 1948.

This situation is gratifying in view of the continued increase in the cost of printing. The invoice for the September issue showed a cost of approximately $8.00 per page, in contrast with our former favorable rate of $5.50 which persisted until well into the war years. Until economic conditions improve we may be faced with the need for limiting the size of the Annals because of sheer cost. At present, in actual cost to the Society, we are returning to our members in the Annals more than four dollars out of their five dollars dues.

This return is possible only through substantial sales of back volumes. We have been fortunate this year, probably because of orders which would have been placed earlier but for the war. These sales, together with the generous policy of the Gorgas Memorial Foundation, which pays the full cost of publication of articles by its associates, have made the year financially very successful.

Our favorable balance has also been aided by DR. WILLIAM PROCTER'S generous continuation of his annual contribution of $500.00.

As will be seen in the financial statement below, these circumstances left the editor with a balance of $3044.66 when the books were closed. Of this sum, $2500 have been transferred to the Treasurer. An apparent discrepancy in this statement between the sum paid to the engravers and the amount received from authors for cuts is due to the fact that the September issue was mailed late, so that remittances for cuts printed in it are outstanding, as well as those for the December issue, although we have paid the engravers for this material.

In trying to evaluate the current trends, the editor foresees that sales may very well fall off during the next few years and that the cost of publication may still rise somewhat. While curtailing the size of the Annals may be a necessary step in meeting these conditions, it seems also that the Society might do well to consider securing lower costs and possibly some revenue from advertising. Although we have never carried advertisements, a few pages might very easily be secured from publishers and dealers in entomological supplies.

The editor regrets that this report must be his swan song. His position as a teacher and department head cannot be unique, since all colleges are now heavily loaded, but it is such that he cannot do justice either to Denison or to the Annals under present conditions. He has thoroughly enjoyed the editorship and thanks the Society for the opportunity to carry it for these three years. And in resigning he wishes to reiterate and to emphasize a need to which DR. C. H. KENNEDY called attention while he was editor. The extent of business transactions involved in publishing the Annals has become too great for one man to handle as a labor of love—unless he has private means to free him from the need of earning a living. It might be possible in a larger institution than Denison if the editor could secure the part-time services of a competent stenographer who could also handle our small amount of bookkeeping, and some help, possibly from dependable graduate students, for making up orders and wrapping them for shipment. Otherwise it seems imperative that the duties be divided between an editor and a business manager. Under that arrangement it would be far better for both to be in the same institution so that they could work together conveniently.

FINANCIAL STATEMENT

December 19, 1946—December 10, 1947

RECEIPTS

Non-member subscriptions and sales from Columbus office	$1,768.91
Sales of back numbers	798.29
Gift of Dr. William Procter	500.00
From authors for cuts	580.48
Gorgas Memorial Foundation, cuts and printing	476.18
Bank balance Dec. 1, 1946	1,501.32
Total	$5,625.18

DISBURSEMENTS

Engraving	$1,001.71
Postage	143.76
Stationery, wrappers and miscellaneous supplies	65.40
Refunds on subscriptions (chiefly duplicated orders)	29.90
Stenographic and addressograph service	339.50
Transferred to treasurer, Dec., 1946	1,000.00
Bank charge	.25
Balance in Peoples State Bank, Granville, O., Dec. 10, 1947	3,044.66
Total	$5,625.18

Respectfully submitted,

A. W. LINDSEY, *Managing Editor.*

It was moved and seconded that the Managing Editor's report be accepted as read, subject to the approval of the Auditing Committee. Motion carried.

REPORT OF THE TREASURER OF THE THOMAS SAY FOUNDATION

RECEIPTS

Balance on hand December 1, 1946	$3,643.25	
1946 sales paid in 1947	13.00	
1947 sales of Volume I—7 @ $3.00	21.00	
1947 sales of Volume I—1 @ $2.70	2.70	
1947 sales of Volume II—7 @ $5.00	35.00	
1947 sales of Volume II—4 @ $4.50	18.00	
1947 sales of Volume III—4 @ $4.00	16.00	
1947 sales of Volume III—1 @ $4.15	4.15	
1947 sales of Volume III—1 @ $3.60	3.60	
1947 sales of Volume III—1 @ $3.53	3.53	
1947 sales of Volume III—1 @ $3.00*	3.90	
Interest to June 30, 1947	36.54	
Total Receipts		$3,799.77

*$1.00 rebate on advertising.

EXPENDITURES

Postage	$ 2.81	
Due on 1947 sales	32.10	
Total Expenditures		34.91
Balance		$3,764.86
Balance in Purdue State Bank, December 23, 1947		$3,764.86

Respectfully submitted,

J. J. DAVIS, *Editor and Treasurer.*

It was moved and seconded that the report of Editor and Treasurer of the Thomas Say Foundation be adopted as read, subject to the approval of the Auditing Committee. Motion carried.

REPORT OF THE AUDITING COMMITTEE

We, the undersigned members of the Auditing Committee, beg to report that we have carefully examined the accounts of H. H. Ross, Treasurer of the Society; J. J. DAVIS, Treasurer of the Thomas Say Foundation, and A. W. LINDSEY, Managing Editor of the Annals, for the year 1947, and have found them to be correct and properly balanced.

The accounts of the Treasurer of the Society were examined by W. V. BALDUF; those of the Treasurer of the Thomas Say Foundation by B. E. MONTGOMERY, and those of the Managing Editor of the Annals by A. M. DEWEY.

Respectfully submitted,

A. M. DEWEY,
B. ELWOOD MONTGOMERY,
W. V. BALDUF, *Chairman.*

It was moved and seconded that the report of the Auditing Committee be adopted as read. Motion carried.

FINAL REPORT OF THE INSECT PHYSIOLOGY COMMITTEE

At the 1945 annual business meeting in St. Louis of the ESA, this committee was set up by the President of the society for the purpose of starting, if possible, a journal of insect physiology.

The Committee obtained from a number of publishers estimates of possible cost of publication of a journal of insect physiology. The estimates were made as of May, 1946, and on the assumption that the proposed journal would have a format comparable to that of the Journal of Cellular and Comparative Physiology, would appear quarterly, and would total about 500 pages per annual volume. On the basis of these estimates, the committee concluded that annual cost of

publication, including necessary stenographic, postage, and incidental expenses, would amount to $5,000.00. It was assumed that services of editor and editorial board would be without salary.

This committee is agreed that the establishment of a journal of insect physiology of high standard, available as a place of publication, regardless of society affiliations, for all who do basic research in insect physiology, biochemistry, biophysics, or on mode of action of poisons on insects, would be of enduring benefit to entomology as a whole. The willingness of various insect physiologists, who are not members of either the ESA or the AAEE to participate in the insect physiology program of the society, is evidence that a section of physiology within the ESA could serve as a focal point for fundamental work of this sort, to the profit of both insect physiology and the broader field of general entomology. A failure to do so may mean that the bulk of such research will become centered elsewhere. The committee feels that the Entomological Society of America does well to encourage the participation of non-member physiologists in its insect physiology programs, and to work toward the establishment, on a sound financial basis, of an insect physiology journal of high standard.

In view of this, the committee wishes to make two recommendations:

RECOMMENDATION 1

The formation of a permanent Insect Physiological Section to have sessions every year at the annual meeting of the Society.

a. That this Section be under the management of a committee of three, consisting of chairman, vice-chairman, and secretery.

b. That these be appointed annually by the Executive Committee.

c. That the program of the sessions consist of papers, special discussions, or other features in the field of insect physiology, according to the discretion of the committee.

RECOMMENDATION 2

That a Journal of Insect Physiology be established to publish papers on insect physiology, biochemistry, biophysics, and mode of action, etc.

a. That a permanent committee of the Society be formed, to be known as the Insect Physiology Foundation, empowered to proceed with financing and publication of the journal. This Foundation shall be similar to the Thomas Say Foundation in its relations and responsibilities to the Society.

b. That this committee shall consist of a managing editor and an editorial board of six members. Each member of the committee shall be elected for a term of six years. It is recommended that for any one person, consecutive terms of office be limited to two.

c. For the purposes of initialing the Foundation, it is recommended that the initial editorial board be made up of two members to serve six years, two to serve four, and two to serve two. This will result in the retirement of two board members each two years.

Figures on cost and a conservative study of sales indicate that this Journal would be able to start with the help of only a comparatively small outlay, and would be self-supporting within approximately a year.

This committee therefore recommends that a sum of $1,000 be appropriated to initiate this Journal. It is understood that this sum would be returned to the Society when the Journal is solvent and in a going condition.

Respectfully submitted,

CLYDE W. KEARNS,
A. GLENN RICHARDS,
J. FRANKLIN YEAGER, *Chairman*.

The Executive Committee placed before the meeting its recommendation that the Report of the Insect Physiology Committee be adopted, that $1,000 be appropriated from the Permanent Fund for the establishment of the Journal of Insect Physiology, and the Committee continue to function until it names the initial editorial staff of this Journal. Considerable discussion ensued and the Committee was praised for its

courage in going ahead with this difficult undertaking. After the discussion it was moved and seconded that the recommendation of the Executive Committee be adopted, and the motion was carried unanimously.

After this, Dr. R. W. Harned opened the subject of the Entomological Society joining the American Institute of Biological Sciences. Dr. Harned recommended that the Society consider this very seriously. Dr. Neil Stevens gave a frank discussion of the subject, readily admitting that the movement was a gamble in many respects but expressed the thought that it could be a worthwhile one and well worth a chance. The Executive Committee report was given, in which it was pointed out that there were several objections to the proposal including duplication of dues that would devolve on individuals belonging to several societies, that the benefits were extremely indefinite, and that it would be necessary to circularize the membership to raise the dues in order to pay the membership fee. The Executive Committee felt that the Society was definitely interested in this type of organization but in view of the objections and difficulties suggested that we investigate the matter further to clarify these issues and that a committee be appointed for this purpose. It was moved and seconded that this be put in form of a motion and be adopted. Motion carried.

At the suggestion of J. M. Hutzel of the AAAS it was moved and seconded that Society representatives on the Council of the Association be elected for three years and that an alternate be nominated also. Motion carried.

REPORT OF THE JOINT COMMITTEE ON THE PREPARATION OF A HISTORY OF ENTOMOLOGY IN RELATION TO WORLD WAR II

DECEMBER, 1947

1. The American Association of Economic Entomologists and the Entomological Society of America, at the annual meetings held in Richmond, Va., in December, 1946, passed resolutions calling for the appointment of a joint committee on the preparation of a history of entomology in relation to World War II.

2. The committee appointed for this purpose has accomplished the following:

a. Prepared a preliminary outline of the history to serve as a guide in the assembling of information and writing of the report, given below.

b. Prepared and mailed questionnaires regarding war service to entomologists who served in the armed forces. These questionnaires were sent to 415 individuals, and approximately 195 returns were received.

c. Mailed questionnaires to 46 colleges and universities, requesting information concerning entomological contributions to the war effort. Twelve replies have been received.

d. Secured statements of wartime entomological activities from the Tennessee Valley Authority; U. S. Public Health Service Laboratories at Savannah, Ga., and Memphis, Tenn.; Divisions 9 and 10 of the National Defense Research Committee; the Rockefeller Foundation; and seven divisions of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. In addition, statements from the Malaria Control in War Areas organization and the U. S. Army Typhus Commission have been promised.

e. Requested statement concerning entomological contribution of approximately 20 industrial concerns. Responses were received from eight firms.

3. Much additional work remains to be done in collecting, tabulating and analyzing data; in the assembling of the data obtained; and in writing the manuscript.

4. In view of the above, the following recommendations are made:

a. That MR. E. C. CUSHING be appointed general editor to secure any additional data that are required, analyze the information obtained, and assemble and edit the history. (See Note 1.)

b. That the sponsoring societies authorize the expenditure of $1,000 to pay the editor selected for his time and travel expenses, and to cover clerical assistance required in writing the history.

c. That a joint committee of four be appointed to assist the editor and to serve as an advisory board in the preparation and publication of the history.

d. That the history be printed and issued as a joint publication of the two sponsoring societies, following the general format of the Annals of the Entomological Society of America.

e. That cost of publication be met by the two sponsoring societies, utilizing any special funds now available or that may become available for this purpose.

Note 1. Informal inquiry indicates that MR. CUSHING would be willing to assume this responsibility under conditions recommended in paragraph 4*b*. It is believed that his writing ability, familiarity with federal and state agencies and industrial concerns, his experience as a commissioned officer during the war and general contacts with the many phases of wartime entomology, qualify him for the task.

Note 2. The American Association of Economic Entomologists mimeographed the questionnaires (2200 sheets) and the Entomological Society of America provided funds to the extent of $21.29 for postage, preparation of correspondence, addressing and mailing of questionnaires. It is believed this is a reasonably equitable division of expenses involved in the activities of the committee.

OUTLINE OF HISTORY OF ENTOMOLOGY IN RELATION TO WORLD WAR II

I. Introduction. Brief history of entomology.
   a. Prior to World War I.
   b. During World War I.
   c. Between World War I and World War II.

II. Entomological Activity During World War II.
   a. Contributions of entomologists serving with the Armed Forces.
   b. Direct contributions of non-military entomologists to the Armed Forces.
   c. Entomology in relation to national health and economy.

III. Critical Analysis of Entomology in Relation to the War Effort.
   a. Status of entomology at the beginning of World War II.
   b. Appraisal of entomological activity during World War II.

IV. Recommendations.

STANLEY W. BROMLEY,
RALPH W. BUNN,
EDWARD F. KNIPLING,
PAUL W. OMAN, *Chairman*.

The report was read by Dr. Oman who moved its adoption. After considerable discussion a substitute motion was made and seconded that the recommendation of this committee be referred to the Executive Committee which be authorized to make expenditures according to its judgment to further this *History*. It was further stipulated that this motion pertained only to preparing the manuscript and implies no guarantee regarding publication, which question was deferred for consideration until the manuscript is completed. Motion carried.

ANNUAL REPORT OF THE JOINT AMERICAN COMMITTEE ON ENTOMOLOGICAL NOMENCLATURE

During the year 1947 the American Committee on Entomological Nomenclature concluded its study of several problems referred to it by American entomologists. The first of these involved the question of misidentified genotypes. The applicant was advised to follow Opinions 65 and 168 of the International Commission on Zoological Nomenclature in dealing with this problem. The second question, concerning the status of names placed upon the "Official List of Generic Names in Zoology" resulted in the conclusion that there are apparently two kinds of names on the "Official List," those which had been added in the absence of objections from zoologists at the time when they were considered, and those which had been added through the exercise of the Plenary Power of the International Commission. These two classes of names are regarded as having quite different status. The third case involved the valid name of the Dipterous family Ortalidae *auctt.* The applicant was advised of the apparent application of the International Rules of Zoological Nomenclature in this case, but further action, including possible representation to the International Commission for suspension of the rules, was left up to the applicant. A fourth study involved certain problems relating to the status of generic names proposed after December 31, 1930, without definite unambiguous designation of the type species. The cases presented included problems considered to be of such importance that a petition requesting clarification has been prepared for submission to the International Commission on Zoological Nomenclature.

In addition to these specific problems, your Committee has expressed its opinion upon a number of matters now pending before the International Commission on Zoological Nomenclature and has prepared a petition to the Commission upon the status to be accorded to names proposed as names for forms of infraspecific rank.

Finally, your Committee has availed itself of the opportunity offered by the presence in this country of MR. FRANCIS HEMMING, Secretary of the International Commission on Zoological Nomenclature, to meet with him and discuss problems of mutual interest.

Any matters of nomenclature which American entomologists wish to refer to the Committee may be directed to its chairman, MR. C. F. W. MUESEBECK, or to the undersigned as Secretary.

Respectfully submitted,

E. G. LINSLEY, *Secretary.*

Dr. Richards introduced a letter and material from the National Society for Medical Research. It was moved and seconded that the Secretary be instructed to write to this Society and express a desire to become a member of it, and to consider this an application for such membership. Motion carried.

President Metcalf read cordial and inspiring letters from Dr. L. O. Howard and Professor Herbert Osborn. It was moved and seconded that the Secretary write to these, and tell them that the letters were greatly appreciated by the Society which sends them the best of wishes for the New Year.

Dr. Fracker gave an informal report on the National Science Foundation and Dr. Mickel gave a report on the AAAS Council meetings.

REPORT OF THE RESOLUTIONS COMMITTEE

1. *Resolved*, That the Society express its appreciation to the Joint Committee for Local Arrangements: GEORGE C. DECKER, chairman; CHARLES SEEVERS, RUPERT L. WENZEL, C. NORMAN DOLD, EDWARD L. THOMAS; to the Officers of the Society; and to the A.A.A.S., particularly to its Equipment Committee headed by DR. VAN NIMAN, for their efforts on behalf of this meeting.

2. *Resolved*, That the Society express its gratitude to the management of the Congress Hotel for numerous courtesies contributing to the success of the meetings.

3. *Resolved*, That the Society express its appreciation to DR. A. E. EMERSON for his scholarly presentation of the Annual Public Address of the Society, on the "Zoogeography of Termites."

4. *Resolved*, That the Society express its sincere regret for the loss through death of several of its members during the past year and that an expression of sympathy be sent to the families of the deceased.

5. *Resolved*, That the sincere appreciation of the Society be expressed to DR. WILLIAM PROCTER for his generous contribution of a sum of $500.00 to the Annals of the Entomological Society of America for the year 1964–1947.

6. *Resolved*, That the Society is gratified to note the continued and increased interest in the session on Insect Physiology; and

7. *Resolved*, That the Society express its appreciation to DR. A. WETMORE and the Smithsonian Institution for making possible the visit to this country of MR. FRANCIS HEMMING, Secretary of the International Commission on Zoological Nomenclature.

Respectfully submitted,

B. D. BURKS,
H. E. MILLIRON,
C. W. SABROSKY, *Chairman.*

It was moved and seconded that the report of the Resolutions Committee be adopted as read. Motion carried.

REPORT OF THE NOMINATION COMMITTEE

Your nominating committee presents the following officers for the coming year:

President.....H. H. KNIGHT
First Vice-President.....E. G. LINSLEY
Second Vice-President.....PAUL OMAN
Secretary-Treasurer.....HERBERT ROSS

R. E. TRAUB,
AL BOYCE,
H. B. HUNGERFORD, *Chairman.*

After a call for further nominations it was moved and seconded that the nominations be closed and that the Secretary be instructed to cast a unanimous ballot for these offices. Motion carried.

The meeting then adjourned.

THE ENTOMOLOGICAL SOCIETY OF AMERICA

LIST OF MEMBERS

(MARCH, 1948)

In this list, which is arranged alphabetically, members are given in lower case type, Fellows in small capitals and Honorary Fellows in capitals. The year of admission to membership is given before the name, and of election to Fellowship and Honorary Fellowship in parentheses following the address. Names of Life Members are indicated by asterisk (*) and the special field of work in italics. Ch. indicates Charter Member, 1906.

A

'39. Aamodt, T. L., State Entomologist's Office, University Farm, St. Paul, Minn.
'47. Abdel-Malek, Albert, Box 12081, University Station, Columbus 10, Ohio.
'27. ADAMS, C. F., State Board of Health, Jefferson City. Mo. (F. '29). *Diptera.*
'40. Ahrens, Carsten, 3461 Harrisburg St., Pittsburgh 4, Pa. *Odonata.*
'10. ALEXANDER, CHARLES P., Massachusetts State College, Amherst, Mass. (F. '20). *Tipulidae.*
'33. Alexander, E. Gordon, Department of Biology, University of Colorado, Boulder, Colo. *Orthoptera.*
'25. ALLEN, H. W., Box 150, Moorestown, N. J. (F. '40). *Tiphiidae, Tachinidae.*
'42. Allen, Theodore, 2520 Mulberry Ave., Muscatine, Iowa.
'32. Amos, John M., 403 State Office Building, Nashville 3, Tenn. *Coccidae, Cerambycidae.*
'30. Anderson, Edwin J., Frear Laboratory, State College, Pa. *Beekeeping.*
'29. Anderson, Lauren D., Virginia Truck Experiment Station, P. O. Box 2160, Norfolk 1, Va. *Gerridae.*
'47. Anderson, M. L., Virginia Smelting Co., West Norfolk, Va.
'37. Anderson, William H., Room 429, U. S. National Museum, Washington 25, D. C. *Coleopterous larvae.*
'39. ANDRE, FLOYD, College of Agriculture, University of Wisconsin, Madison, Wis. (F. '47). *Thysanoptera.*
'32. ANNAND, P. N., Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '39). *Aphids.*
'28. App, Bernard A., Box 297, Fort Valley, Ga. *Economic Entomology.*
'40. Archer, Allan F., Museum of Natural History, University, Ala. *Arachnida*
'23. Armstrong, Thomas, Dominion Entomological Laboratory, Vineland Station, Ontario, Canada. *Scarabaeidae.*
'36. Ashton, Donald F., 2711 Van Dyke Ave., Raleigh, N. C. *Culicidae.*
'37. Assmuth, Rev. Joseph, Fordham University, New York 58, N. Y. *Isoptera.*
'42. Atkins— E. Laurence, Jr., University of California, Citrus Experiment Station, Division of Entomology, Riverside, Calif.
'34. Au, Sung Hin, 1911 Dole St., Honolulu 33, T. Hawaii. *Aphids.*
'33. AVINOFF, A., Hidden Valley, Locust Valley, Long Island, N. Y. (F. '39). *Lepidoptera.*

B

'37. Babers, Frank H., P. O. Box 3391, Orlando, Fla. *Physiology.*
Ch. *BACK, E. A., Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '38). *Asilidae, Aleyrodidae.*
'39. Badertscher, A. Edison, 103 Bonnie Hill Road, Towson, Baltimore 4, Md. *Insecticides.*
'21. BAERG, W. J., University of Arkansas, Fayetteville, Ark. (F. '32). *Poisonous Arthropods.*
'30. *Bailey, J. W., 27 Willway Road, Richmond, Va. *Myriapoda.*
'47. Bailey, Norman S., 16 Neponset Ave., Hyde Park 36, Mass. *Tabanidae, Tingidae.*

'11. BAKER, A. C., Apartado Number 3, Colonia Anahuac, D. F., Mexico. (F. '29). *Aphididae, Aleyrodidae.*
Baker, A. W., Ontario Agricultural College, Guelph, Ontario, Canada.
'22. Baker, Howard, Bureau of Entomology and Plant Quarantine, Washington 25, D. C. *Apple and Pecan Insects.*
'36. Baker, Walter C., Carter Memorial Laboratory, P. O. Box 547, Savannah, Ga. *Toxicology.*
'28. BALCH, R. E., Dominion Entomological Laboratory, Fredericton, New Brunswick, Canada (F. '44). *Forest Insects.*
'20. BALDUF, W. V., 308 Harker Hall, University of Illinois, Urbana, Ill. (F. '40). *Entomophagous Insects.*
'45. Ball, William Howard, Box 392, College Park, Md.
'38. Ballou, Charles H., Instituto Experimental de Agricultura, El Valle, Distrito Federal, Venezuela. *Economic Entomology.*
'43. Balock, John W., P. O. Box 2280, Honolulu 4, T. Hawaii.
'08. BANKS, NATHAN, 103 Norfolk St., Holliston, Mass. (F. '14, H. F. '45).
Ch. BARBER, H. G., 143 East Third Ave., Roselle, N. J. (F. '30). *Hemiptera, Lygaeidae.*
Ch. BARBER, H. S., U. S. National Museum, Washington 25, D. C. (F. '28). *Coleoptera.*
'23. Bare, Clarence O., Box 7062, Richmond 21, Va. *Notonectidae.*
'26. BARNES, H. F., Rothamsted Experiment Station, Harpenden Herts, England. (F. '37). *Cecidomyiidae.*
'43. Barnes, Ralph C., U. S. P. H. S., 605 Volunteer Bldg., Atlanta, Ga.
'40. Barnett, Lt. Herbert C., O-529738, Hq. Army Med. Dept. Schools, Fort Sam Houston, Texas.
'47. Barr, William F., Department of Entomology, University of Idaho, Moscow, Idaho. *Buprestidae, Cleridae.*
'39. Barrett, John P., c/o Armour and Company, Department of Chemical Research, Union Stock Yards, Chicago 9, Ill. *Calliphoridae.*
'41. Barrett, Paul H., 441 W. Second St., Apt. 404, Le ington, Ky. *Aquatic Insects.*
'35. Barrett, W. L., Jr., P. O. Box 5687, Stock Yards Station, Kansas City, Mo. *Diptera, Ectoparasites.*
Barro, Manuel, Calle 12 #220, Vedado, Habana, Cuba.
'46. Bartholomai, C. W., 1123 N. 16th St., Lafayette, Ind.
'47. Basham, Ernestine H., Florida State Board of Health, P. O. Box 210, Jacksonville 1, Fla. *Diptera, Culicidae.*
'18. BASINGER, A. J., Citrus Experiment Station, Riverside, Calif. (F. '41). *Calliphoridae.*
'31. BATES, MARSTON, Rockefeller Foundation, Apartado 757, Villavicencio, Colombia (F. '40). *Diptera, Trypetidae.*
'24. BEAMER, RAYMOND H., 1000 Missouri St., Lawrence, Kans. (F. '34). *Homoptera, Cicadellidae.*
'46. Beatie, Russel H., Westvaco Chlorine Products Corp., 405 Lexington Ave., New York 17, N. Y.
'34. Beck, Elmer W., Box 576, Toledo, Ohio. *Parasites European Corn Borer.*
'47. Beck, Stanley D., Department of Zoology, University of Wisconsin, Madison, Wis.
'47. Beckham, Clifford Myron, Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio.
'29. Bedard, W. Delles, 335 Giannini Hall, University of California, Berkeley, Calif. *Scotylidae, Braconidae.*
'20. Bedford, Hugh W., Government Entomologist, Agricultural Research Service, Entomology Section Wad Medani, Sudan, Africa.
'43. BEEBE, WILLIAM, New York Zoological Society, Zoological Park, Bronx Park, New York, N. Y. (F. '44).
'42. Belkin, John N., Department of Biology, Mohawk College, Utica 5, N. Y. *Culicidae, Tabanidae.*
'25. BELL, ERNEST L., 150-17 Roosevelt Ave., Flushing, N. Y. (F. '40). *Hesperiidae.*
'40. Benesh, Bernard, P. O. Box 159, North Chicago, Ill. *Lucanidae.*
Ch. Bentley, Gordon M., 64 Biology Bldg., University of Tennessee, Knoxville 16, Tenn. *Orthoptera.*

'23. Benton, Curtis, 1216 Ball St., Lafayette, Ind.
'17. *Bequaert, Joseph C., Curator of Insects, Museum of Comparative Zoology, Cambridge, Mass. (F. '34). *Vespidae, Tabanidae.*
'28. Berly, J. A., Division of Entomology, Clemson College, S. C. *Coccidae, Odonata.*
'43. Berner, Lewis, Department of Biology, University of Florida, Gainesville, Florida.
'39. Berry, Paul A., United States Embassy, Paris, France. *Biological Control.*
'34. Bess, Henry A., 623 N. Second St., Milwaukee 3, Wis. *Ecology, Forest Insects.*
Ch. Betten, Cornelius, 104 Corson Place, Ithaca, N. Y. (F. '37). *Trichoptera.*
'47. Biaggi, Virgilio, Biology Department, College of Agriculture, Mayaquez, Puerto Rico.
'28. Bibby, F. F., Smithville, Miss. *Cicadidae.*
'47. Bick, George H., Department of Entomology, Cornell University, Ithaca, N. Y.
'38. *Bickley, William E., Jr., Laboratories of Biology, University of Richmond, Richmond, Va. *Chrysopidae.*
'25. Bigger, J. H., Natural Resources Bldg., Urbana, Ill. *Plant Resistance to Insect Attack.*
'30. Billings, Samuel C., 8434 Piney Branch Court, Silver Springs, Md. *Mothproofing.*
'13. Bilsing, S. W., College Station, Texas. (F. '41). *Cerambycidae.*
Ch. Bird, Henry, 600 Milton Road, Rye, N. Y. (F. '30). *Noctuidae, Papaipema.*
'24. Bishop, Sherman C., Department of Biology, University of Rochester, Rochester, N. Y. (F. '43). *Arachnida.*
Ch. Bishopp, F. C., Bureau of Entomology and Plant Quarantine, Washington 25 D. C. (F. '28). *Ixodoidea, Siphonaptera, Anoplura.*
'25. Bissell, Theodore L., Department of Entomology, University of Maryland, College Park, Md. *Aphididae, Curculionidae.*
'37. Blackburn, Norris D., Department of Zoology and Entomology, Pennsylvania State College, State College, Pa. *Chrysomelidae.*
'32. Blanton, Franklin S., 3723 Holmes Lane, Building 504, Parkfairfax, Alexandria, Va. (F. '46). *Trypetidae, Otitidae.*
'30. Blauvelt, Helen Hayden, c/o William Savey, Lake Road, Ithaca, N. Y.
'28. Blauvelt, William E., Comstock Hall, Cornell University, Ithaca, N. Y.
'29. Boesel, M. W., R. R. #2, Oxford, Ohio. (F. '43). *Heleidae, Tendipedidae (Chironomidae).*
'44. Bohart, George Edward, 775 E. Center St., Logan, Utah.
'37. Bohart, Richard M., Division of Entomology, College of Agriculture, Davis, Calif. (F. '47). *Strepsiptera, Vespidae.*
'46. Bonhag, Philip F., Department of Entomology, Comstock Hall, Cornell University, Ithaca, N. Y. *Diptera.*
'28. Borror, Donald J., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio. (F. '43). *Odonata.*
'46. Boudreaux, H. Bruce, Department of Zoology, Louisiana State University, Baton Rouge 3, La. *Aphididae.*
'14. BOVING, ADAM G., 221 Rock Creek Church Road, Washington 11, D. C. (F. '29, H. F. '41). *Coleopterous Larvae.*
'33. Boyce, A. M., Citrus Experiment Station, Riverside, Calif.
Ch. Bradley, J. C., Cornell University, Ithaca, N. Y. (F. '14). *Campsomeris, Vespidae, Scoliidae.*
'19. Bradley, G. H., Box 654, New Smyrna Beach, Fla. (F. '41). *Diptera, Culicidae.*
'37. Bradley, William G., 2256 Collingwood Ave., Toledo, Ohio. *Parasitic Hymenoptera.*
'23. Branch, Hazel E., University of Wichita, Wichita 6, Kans. *Chironomidae Larvae.*
'25. Brandhorst, Carl T., 106 Lincoln St., Seward, Neb. *Wasps.*
Ch. Braun, Annette F., R. R. #13, Box 41C, Cincinnati 30, Ohio. (F. '24). *Microlepidoptera, Trichoptera.*
'26. Breaky, E. P., Western Washington Experiment Station, Puyallup, Wash. (F. '43). *Cicadellidae.*

'37. Breland, Osmond P., Department of Zoology, University of Texas, Austin, Texas. *Chalcidoidea, Culicidae.*
'29. Brindley, T. A., 822 East Eighth St., Moscow, Idaho. *Pea Weevil.*
'26. BRITTAIN, W. H., McDonald College, Quebec, P. Q., Canada. (F. '37). *Homoptera.*
'20. BROMLEY, STANLEY W., Scoffieldtoan Road, Stamford, Conn. (F. '37). *Asilidae.*
'40. Brookman, Bernard, Hooper Foundation, University of California Medical Center, San Francisco 22, Calif. *Diptera, Culicidae.*
'47. Brooks, George T., 736 Missouri St., Lawrence, Kans.
'39. Brower, Auburn E., 5 Hospital St., Augusta, Me. *Lepidoptera, Catocala.*
'33. BROWN, F. MARTIN, Fountain Valley School, Colorado Springs, Colo. (F. '44). *Pieridae of the Americas.*
'42. Brown, John H., Administration Building, Department of Public Health, Edmonton, Alberta, Canada.
'26. BROWN, W. J., Entomological Branch, Department of Agriculture, Ottawa, Canada. (F. '40). *Coleoptera.*
'47. Bruce, Willis N., 128 Natural Resources Bldg., Urbana, Ill.
Ch. BRUES, C. T., Biological Laboratory, Harvard University, Cambridge, Mass. (F. '14, H. F. '46). *Hymenoptera.*
'30. BRUNER, S. C., Estacion Agronomica, Santiago de las Vegas, Havana, Cuba. (F. '37). *Homoptera, Hemiptera of Cuba.*
'27. Brunson, Marvin Howard, Box 150, Moorestown, N. J.
'33. BRYANT, ELIZABETH B., Museum of Comparative Zoology, Cambridge 38, Mass. (F. '43). *Arachnida.*
'30. Bryant, Owen, Steamboat Springs, Colo. *Coccinellidae.*
'38. Bryce, P. I., Entomological Laboratory, Vineland Station, Ontario, Canada. *Fruit Tree Insects.*
'45. Buchanan, William Dwight, 522 Remington St., Fort Collins, Colo.
'47. Bucher, Gordon E., 464 Spadina Road, Apt. 2, Toronto, Ontario, Canada. *Morphology, Physiology, Biological Control.*
'27. Buckell, E. R., Field Crop Insect Laboratory, P. O. Building, Kamloops, British Columbia, Canada. *Orthoptera, Odonata.*
Ch. *BUENO, J. R. DE LA TORRE, 925 East Sixth St., Tucson, Ariz. (F. '28). *Aquatic Hemiptera, Heteroptera.*
'31. Bugbee, Robert E., Department of Biology, Allegheny College, Meadville, Pa. *Chalcidoidea.*
'38. Bunn, Ralph W., 5615 Oakmont Ave., Bethesda 14, Md. *Fulgoridae, Curculionidae.*
'45. Buren, William F., Assistant Sanitarian (R), U. S. Public Health Service, P. O. Drawer 1246, Miami Beach, Fla.
Ch. BURGESS, A. F., 24 Franklin St., Greenfield, Mass. (F. '17). *Carabidae, Lepidoptera.*
'35. BURKS, B. D., Illinois Natural History Survey, Urbana, Ill. (F. '44). *Chalcididae.*
'27. *Burrell, Robert W., P. O. Box 1291, Yakima, Wash.
'29. Bushey, Clinton J., Taylor University, Upland, Ind. *Curculio.*
'35. Bussart, J. Everett, 215 West Harrison St., Wheaton, Ill. *Tachinid Biology.*
'30. BUTT, F. H., Cornell University, Ithaca, N. Y. (F. '40). *Morphology, Embryology.*
'20. Buys, John L., Department of Biology, St. Lawrence University, Canton, N. Y. *Homoptera, Cicadellidae.*
'36. Buzicky, Albert W., 512 Montrose Lane, St. Paul 5, Minn. *Chyphotes.*
'46. Byars, L. Freeland, P. O. Box 1595, Nogales, Ariz. *Ecology of Ants.*
'24. BYERS, C. FRANCIS, Department of Biology, University of Florida, Gainesville, Fla. (F. '41). *Odonata.*

C

'35. *CALDWELL, JOHN S., 535 South Court St., Circleville, Ohio. (F. '46). *Fulgoridae, Psyllidae.*
'43. Callan, E. McC., Imperial College of Tropical Agriculture, St. Augustine, Trinidad, Brit. W. Indies. *Hymenoptera.*
Ch. CALVERT, PHILIP P., P. O. Box 14, Cheyney, Pa. (F. '07, H. F. '39). *Odonata.*

'46. Campbell, D. K., Box 308, Vernon, British Columbia, Canada. *Forest Entomology.*
'28. CAMPBELL, FRANK LESLIE, The Scientific Monthly, Smithsonian Institution Building, Washington 25, D. C. (F. '34). *Toxicology.*
'13. CAMPBELL, ROY E., 1208 East Main, Alhambra, Calif. (F. '41).
'14. *Capp, S. B., Box 2054, Philadelphia, Pa.
'40. Capps, Hahn W., Division of Insect Identification, U. S. National Museum, Washington 25, D. C. *Geometridae.*
'33. CARPENTER, F. M., Museum of Comparative Zoology, Harvard University, Cambridge, Mass. (F. '38). *Mecoptera, Neuroptera.*
'26. Carpentier, Fritz, Institute of Ed. Van Veneden, 10 Rue Vivegnis, Liege, Belgium. *Morphology.*
'31. Carruth, Laurence A., Division of Entomology, New York Agricultural Experiment Station, Geneva, N. Y. *Meloidae.*
'22. CARTER, WALTER, P. O. Box 3166, Honolulu, Hawaii. (F. '38). *Insect Transmission of Plant Diseases.*
'26. CARTWRIGHT, O. L., Department of Entomology, Clemson College, Clemson, S. C. (F. '41). *Scarabaeidae.*
'26. Cartwright, William B., Box 495, Lafayette, Ind. *Hessian Fly.*
'45. Castillo, Robert Levi, P. O. Box 759, Guayaquil, Ecuador, South America. *Culicidae.*
'46. Cazier, Mont A., American Museum of Natural History, Central Park W. at 79th, New York 24, N. Y.
'47. Chadwick, Leigh E., Medical Division, Army Chemical Center, Edgewood Arsenal, Md. *Insect Physiology.*
'22. CHAMBERLAIN, JOSEPH C., P. O. Box 278, Forest Grove, Ore. (F. '38). *Chelonethida, Arachnida.*
Ch. CHAMBERLIN, R. V., University of Utah, Salt Lake City, Utah. (Fig. 17). *Myriapoda, Arachnida.*
'18. Chambers, Ernest L., Room 424 Northeast, State Capitol, Madison, Wis.
'14. Champion, H. G., Department of Forestry, Imperial Forestry Institute, University of Oxford, Oxford, England. *Coleoptera.*
'18. Chapin, E. A., U. S. National Museum, Division of Insects, Washington 25, D. C.
'15. Chapman, James W., Silliman Institute, Dumaguete, Philippine Islands. *Ants of P. I.*
'41. Chickering, A. M., 206 South Mingo St., Albion, Mich. *Arachnida.*
'13. Childs, Leroy, Hood River Branch Experiment Station, Hood River, Ore. *Apple and Pear Insects.*
'30. Christenson, L. D., Bureau of Entomology and Plant Quarantine, P. O. Box 1066, Riverside, Calif. *Aptera, Myriapoda.*
'47. Christian, Paul J., 1332 Vermont St., Lawrence, Kans.
'27. Clagg, Charles F., 820 Fifteenth St., C.H.A. #3, Honolulu, T. Hawaii. *Mecoptera, Hemiptera.*
'22. Clark, Charles, 2 Mortimer Drive, Old Greenwich, Conn. *Odonata, Ichneumonidae.*
'14. CLAUSEN, CURTIS P., Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '37). *Insect Parasites.*
'47. Coher, Edward I., 12 Harvard Terrace, Allston 34, Mass.
'39. COLCORD, MABEL, 2520 Fourteenth St., N. W., Washington 9, D. C. (F. '43). *Bibliography.*
'28. COLE, ARTHUR C., JR., Department of Zoology, University of Tennessee, Knoxville, Tenn. (F. '43). *Formicidae.*
'47. Cole, Elsie Louise, King Hall, University of Wisconsin, Madison 6, Wis.
'16. COLE, F. R., P. O. Box #6, Redlands, Calif. (F. '38). *Diptera, Hymenoptera.*
'29. Collins, Donald L., 20 Circle Lane, Albany 3, N. Y. *Coleoptera.*
'21. Compton, Charles C., 513 South Pine St., Champaign, Ill. *Greenhouse and Truck Insects.*
'29. Conklin, J. G., Department of Entomology, University of New Hampshire, Durham, N. H. *Coccinellidae.*
'35. Connell, Walter A., Department of Entomology, University of Delaware, Newark, Del. *Diptera.*
'46. Connin, Richard V., 515 Meyers St., Toledo 9, Ohio.
'44. Conroy, John H., 138 Magnolia St., Westbury, Long Island, N. Y.

'47. Cook, Carl, Crailhope, Kentucky. *Odonata, Papilionidae.*
Ch. Cook, Mel T., 255 Barnard Road, Larchmont, N. Y. *Entomogenous Fungi.*
'19. Cook, William C., 219 Newell St., Walla Walla, Wash. (F. '38). *Noctuidae.*
'10. Cooley, R. A., U. S. Public Health Service, Hamilton, Mont. (F. '24). *Ixodidae, Ixodiphiginae.*
'36. Cooper, James Furman, University Experiment Farm, Kearneysville, W. Va. *Fruit Insects.*
'47. Cooper, Murray I., Department of Entomology, University of Illinois, Urbana, Ill.
'39. Cope, Oliver B., North Rotunda, Museum Building, Stanford University, Calif. *Anoplura, Mallophaga, Diptera.*
'32. Cory, Ernest N., State Entomologist, College Park, Md.
'21. COSTA-LIMA, ANGELO M. DA., Instituto Oswaldo Cruz, Caixa Postal 926, Rio de Janeiro, Brazil. (F. '39, H. F. '43). *Economic Entomology.*
'15. Cotton, Richard T., 343 North Fourteenth St., Manhattan, Kans. (F. '37). *Curculionid Larvae.*
'35. Couture, Philip G., U. S. D. A., Bureau of Entomology and Plant Quarantine, U. S. Quarantine Station, Rosebank, Staten Island 5, N. Y.
'46. Cowan, Frank A., 2201 Schulle St., Austin, Texas. *Biology Muscoids.*
'46. Cox, Sam M., 127 North Tenth Ave. East, Duluth 5, Minn.
'11. *Crampton, G. C., 86 Pleasant St., Amherst, Mass. (F. '17). *Morphology.*
'39. Crandall, Robert H., Ghost Ranch Lodge, Box 640, Tucson, Ariz. *Hymenoptera.*
'33. Creighton, John T., University of Florida, Gainesville, Fla. *Economic Entomology.*
Ch. Cresson, E. T., Jr., 11 Amherst Ave., Swarthmore, Pa. (F. '24). *Ephydridae, Micropezidae.*
'38. Crowell, H. H., Department of Entomology, Oregon State College, Corvallis, Ore. *Physiology.*
'15. Curran, C. H., American Museum of Natural History, 77th Street and Central Park W., New York, N. Y. (F. '34). *Diptera.*
'43. Curry, John F., P. O. Box 401, c/o California Department of Agriculture, San Pedro, Calif.
'42. Curtis, William E., 311 Dryden Road, Ithaca, N. Y.
'43. Cutkomp, Laurence K., Division of Entomology, University Farm, St. Paul 1, Minn. *Physiology.*
'21. Cutright, Clifford R., Agricultural Experiment Station, Wooster, Ohio. *Aphidae.*

D

'35. *Daggy, Richard H., Arabian American Oil Company, Dhahran, Saudi Arabia. *Ephemeroptera.*
'42. Dailey, Ervin F., 825 East 78th St., Seattle 5, Wash. *Myriapoda.*
'42. Dalmot, Herbert T., 247 Audubon Ave., New York 33, N. Y.
'47. de Locha, Newton Banks, Bom-fim, 335, Olinda, Pernambuco, Brazil.
'43. Dambach, Charles A., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio.
'47. Dampf, Alfonso Tenson, Apartado 2801, Mexico, D. F., Mexico.
'44. d'Andretta, Carlos, Jr., Escola Paulista de Medicina Rua Botucatai 760, Sao Paulo, Brazil. *Taxonomy, Simuliidae.*
'25. Darlington, P. J., Jr., Museum of Comparative Zoology, Cambridge, Mass. (F. '38). *Adephaga, Dryopidae.*
'30. Davidson, Ralph H., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio. (F. '43). *Cicadellidae.*
'43. Davidson, Thomas R., Dominion Laboratory of Plant Pathology, University of Alberta, Edmonton, Alberta, Canada. *Aphidae.*
'22. Davis, Edgar W., Box 218, Union Gap, Wash. *Cicadellidae.*
Ch. Davis, J. J., Purdue University, Lafayette, Ind. (F. '17). *Aphididae, Lachnosterna.*
'13. Dean, George A., Department of Entomology, Kansas State College, Manhattan, Kansas. (F. '17). *Economic Entomology.*
'33. Dean, Ralph W., Cottage Road, Poughkeepsie, N. Y. *Rhynchophora.*
'36. Dearolf, Kenneth, Chief Curator, Pennsylvania State Museum, Harrisburg, Pa. *Cave Insects.*

'25. DEAY, Howard O., Department of Entomology, Purdue University, Lafayette, Ind. (F. '46). *Coreidae, Tenagobia, Micronecta.*
'38. DeBach, Paul H., University of California, Citrus Experiment Station, Riverside, Calif. *Chalcidoidea.*
'24. Decker, George C., Illinois Natural History Survey, Urbana, Ill. *Stalk Borers, Crambus.*
'24. DeCoursey, R. M., University of Connecticut, Storrs, Conn. *Hemiptera.*
'29. DeLeon, Donald, Box 244, Sta. G, Columbus 7, Ohio. *Scolytidae.*
'14. DELONG, D. M., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio. (F.'30). *Cicadellidae.*
'36. Del Ponte, Edwardo, Instituto Bacteriologico, Calle Velez Sarsfield 563, Dept. Nacional de Hygiene, Buenos Ayres, Argentina. *Parasitic Insects.*
'34. *DENNING, DONALD G., Department of Entomology, University of Wyoming, Laramie, Wyo. (F. '43). *Trichoptera, Corethrinae.*
'34. *Deonier, C. C., Box 3391, Orlando, Fla. *Muscidae.*
'46. Dethier, V. G., Department of Biology, The Johns Hopkins University, Baltimore 18, Md. *Insect Physiology.*
'44. Detjen, Gustav H. H., 303 West 42nd St., New York 18, N. Y.
'27. Dicke, Ferdinand F., Box 576 M. O., Toledo, Ohio. *Harmolita Parasites.*
'39. Dickson, Robert C., Department of Entomology, Citrus Experiment Station, Riverside, Calif. *Aphididae, Coccidae.*
'22. DIETRICH, HENRY, Comstock Hall, Cornell University, Ithaca, N. Y. (F. '43). *Coleoptera.*
'35. Dillon, Lawrence S., Reading Public Museum and Art Gallery, Reading, Pa. *Cerambycidae.*
'24. Dills, L. E., Department of Zoology and Entomology, Pennsylvania State College, State College, Pa.
'26. Dirks, C. O., 32 Coburn Hall, University of Maine, Orono, Me. *Biology of Lepidoptera.*
'31. *Ditman, L. P., University of Maryland, College Park, Md. *Ecology.*
'27. *Doak, K. D., Route A, Crown Point, Ind. *Gelechiidae.*
'36. *Dodge, Harold R., Box 436, Route 3, Montgomery, Ala. *Scolytidae.*
'22. DOERING, KATHLEEN C., Department of Entomology, University of Kansas, Lawrence, Kans. (F. '35). *Cercopidae, Fulgoridae.*
'41. Dorsey, Carl K., 437 Woodlawn Avenue, Webster Groves, Mo. *Immature Coleoptera.*
'37. Dorst, Lt. Col. Howard E., Box 109, U. S. A. C. Campus, Logan, Utah. *Cicadellidae.*
'22. Doucette, Charles F., Box 458, Sumner, Wash. *Ornamental Insects.*
'23. Douglass, J. R., Box 1100, Twin Falls, Idaho.
'45. Doutt, Richard L., 1050 San Pablo Ave., Albany 6, Calif. *Mymaridae.*
'28. DOVE, W. E., Defense Hiway, Gambrills, Md. (F. '40). *Parasites.*
'31. Dow, Richard, Box 135, Berkeley, Calif. *Sphecoid Wasps.*
'22. DOWDEN, PHILIP B., 335 Prospect St., New Haven 11, Conn. (F. '46). *Parasitic Hymenoptera.*
'22. DRAKE, CARL J., Iowa State College, Ames, Iowa. (F. '31). *Tingitidae.*
'37. Dreisbach, Robert R., 301 Helen St., Midland, Mich. *Hymenoptera.*
'31. Driggers, Byrley F., Agricultural Experiment Station, New Brunswick, N. J. *Economic Entomology.*
'38. Drolet, Marcel, 95 Stefoy Road, Quebec, Quebec, Canada. *Cerambycidae.*
'45. DuChanois, F. Robert, Entomological Service & Supply Co., Zionsville, Ind. *Formicidae, Muscoidea.*
'26. Dunavan, David, 116 North Clemson Ave., Clemson, S. C. *Haliplidae.*
'23. DUNCAN, CARL D., Box 4, Stanford University, Calif. (F. '14). *Vespidae, Bembicidae.*
'28. Dunnam, E. W., Box 8, Leland, Miss. *Cotton Resistance to Insects.*
'14. Dusham, E. H., 607 North Burrowes St., State College, Pa. *Coleoptera.*
'43. Dybas, Henry S., Division of Insects, Chicago Natural History Museum, Chicago 5, Ill. *Ptiliidae, Nanosellinae.*

E

Ch. Easton, Norman S., 458 High St., Fall River, Mass. *Coleoptera.*
'44. Eaton, Charles B., Forest Insect Division, Bureau of Entomology and Plant Quarantine, Agricultural Research Center, Beltsville, Md. *Forest Insects.*

'46. Eberlein, George, West Concord, Mass.
'31. ECKERT, J. E., University Farm, University of California, Davis, Calif. (F. '43). *Beekeeping.*
'36. Eddy, C. Brayton, New York Zoological Society, N. Y. Zoological Park, New York 60, N. Y.
'23. EDDY, C. O., Niagara Sprayer and Chemical Co., Middleport, N. Y. (F. '31).
'40. Elishewitz, Harold, 953 Goodrich Ave., St. Paul 5, Minn. *Ixodoidea.*
'24. Elmore, J. C., 1208 East Main, Alhambra, Calif. *Truck Crop Insects.*
'19. EMERSON, ALFRED E., Department of Zoology, University of Chicago, Chicago, Ill. (F. '37). *Isoptera, Termitophiles.*
'38. Emerson, K. C., Entomology Department, Oklahoma A. & M. College, Stillwater, Okla. *Mallophaga, Anoplura.*
'25. Enders, Howard E., 249 Littleton St., West Lafayette, Ind. *Mallophaga.*
Epstein, Erwin, 6302 Dieterle Crescent, Rego Park, Long Island, N. Y.
'43. Esselbaugh, Charles O., 212 Columbia, Pullman, Wash. *Pentatomidae, Scutelleridae.*
'10. ESSIG, E. O., University of California, Berkeley, Calif. (F. '26). *Aphididae, Coccidae.*
'29. Evans, J. Harwood, Oshkosh High School, Oshkosh, Wis. *Phymatidae.*
'30. Everly, Ray T., 4299 N. High St., Columbus 2, Ohio. *Carabidae.*
'10. EWING, HENRY E., U. S. National Museum, Washington, C. D. (F. '28). *Acarina.*
'18. EYER, JOHN R., State College, N. Mex. (F. '38). *Cicadellidae, Chermidae.*

F

'32. FAIRCHILD, GRAHAM BELL, 651 Ancon, 62, Panama. (F. '43). *Culicidae, Tabanidae.*
'40. Fallis, A. Murray, Ontario Research Foundation, 43 Queens Park, Toronto, Ontario, Canada. *Insect Parasites.*
'35. Falls, Olive, 5535 Dorchester Ave., Chicago, Ill. *Termite Biology.*
'30. Farquhar, Donald W., 185 Claremont Ave., New York 27, N. Y. *Lepidoptera of New England.*
'17. Fattig, P. W., Box 788, Emory University, Ga.
'45. Faure, Gabriel O., Dept. Sanidad Vegetal, Casilla 4647, Santiago, Chile, South America.
'34. Fay, Richard William, 417 East 53rd St., Savannah, Ga. *Insect Physiology.*
'36. Fenton, Alfred S., 1002 Second National Bank Building, Houston 2, Tex.
Ch. FERNALD, H. T., 1128 Oxford Road, Winter Park, Fla. (F. '14, H. F. '37). *Sphecidae.*
'47. Fernandez, Francisco J., Ingeniero Agronomo, Calle Oeste, Escuela de Medicina No. 16-A, Caracas, D. F., Venezuela.
'14. FERRIS, G. F., Natural History Museum, Stanford University, Calif. (F. '34). *Coccidae, Mallophaga, Anoplura, Diptera.*
'35. FIELD, WILLIAM D., Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '46). *Arctiidae, Lycaenidae.*
Ch. Field, William L. W., 75 Vose's Lane, Milton 87, Mass.
'31. Filmer, Robert Sterling, Rutgers University, New Brunswick, N. J. *Hymenoptera.*
'35. Fisher, Elizabeth G., 20 Blythewood Road, Baltimore 10, Md. *Odonata, Mycetophilidae.*
'36. Fisk, Frank W., Division of Entomology, University of Minnesota, University Farm, St. Paul 1, Minn. *Culicidae.*
'30. FLANDERS, STANLEY E., Citrus Experiment Station, Riverside, Calif. (F. '37). *Biology of Chalcidoidea.*
'22. Fletcher, Frank C., Room 301, 100 Gibbs St., Rochester 1, N. Y. *Colooptera.*
'31. Fletcher, Fred W., Department of Biochemistry, Dow Chemical Company, Midland, Mich. *Insecticides.*
'43. Flock, Robert A., Citrus Experiment Station, Riverside, Calif.
'24. FLUKE, C. L., King Hall, University of Wisconsin, Madison 6, Wis. (F. '35). *Syrphidae.*
'42. Fluno, John A., 244 Sylvan Blvd., Winter Park, Fla.
'45. Fontaine, Russel E., Surgeons' Sect., Hq. XXIV Corps, APO 235, c/o P. M., San Francisco, Calif.
'38. Forbes, James, 2986 Marion Ave., New York 58, N. Y. *Formicidae.*

'08. *Forbes, William T. M., Cornell University, Ithaca, N. Y. (F. '30). *Lepidoptera, Neuropteroids.*
'30. Foster, Charles E., Colgate University, Hamilton, N. Y. *Coccidae.*
'46. Fox, Irving, School of Tropical Medicine, San Juan, Puerto Rico. *Ectoparasites, Culicoides.*
'11. Fracker, S. B., Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C. (F. '34). *Coreidae.*
'47. Franclemont, John G., Division of Insects, U. S. National Museum, Washington 25, D. C.
'23. Freeborn, Stanley B., 101 Giannini Hall, University of California, Berkeley, Calif. (F. '38. *Culicidae.*
'22. Friend, Roger B., Agricultural Experiment Station, 153 Huntington St., New Haven, Conn. (F. '38). *Diptera.*
'44. Frizzell, Harriet Exline, Department of Zoology, University of Texas, Austin 12, Tex. *Araneida.*
'40. Froeschner, Richard C., 5102a Lotus Ave., St. Louis 13, Mo. *Hemiptera.*
'40. Fronk, W. Don, Tidewater Field Station, Holland, Va.
Ch. Frost, C. A., 67 Henry St., Framingham, Mass. (F. '44). *Coleoptera.*
'41. Frost, Florence M., 1376 Shattuck Ave., Berkeley 7, Calif. *Diptera.*
'14. Frost, Stuart W., 465 East Foster Ave., State College, Pa. (F. '35). *Agromyzidae, Hispinae.*
Ch. Fullaway, D. T., Agricultural Board, Box 3319, Honolulu, Hawaii. (F. '40). *Parasitic Hymenoptera, Braconidae.*
'16. Fulton, B. B., State College, Raleigh, N. C. (F. '32). *Orthoptera.*
'11. Funkhouser, William D., University of Kentucky, Lexington, Ky. (F. '20). *Membracidae.*
'40. Furniss, Robert L., 445, U. S. Court House, Portland, Ore. *Forest Entomology.*

G

Ch. Gahan, A. B., U. S. National Museum, Washington, D. C. (F. '28). *Chalcidoidea.*
'16. Gaige, F. M., 1211 Ferdon Road, Ann Arbor, Mich. (F. '38). *Formicidae.*
'26. Galindo, Pedro, Apartado 1443, Panama, Republica de Panama.
'47. Gammons, John Gray, 2911 S. Dinwiddie St., Apt. C-1, Fairlington, Arlington, Va. *Culicidae, Tabanidae.*
'22. Garlick, W. G. P., Vineland Station, Ontario, Canada. *Tenthrediniodea.*
'14. Garman, Philip, Agricultural Experiment Station, New Haven, Conn. (F. '38). *Odonata, Acarina.*
'46. Gaul, Albro, 401 Washington Ave., Brooklyn 5, N. Y. *Vespinae, Polistinae.*
'39. Gauthier, Georges, Entomologiste, Ministere de l'Agriculture, Quebec, Canada.
'45. Gelfand, Henry M., 6005 University Ave., Chicago 37, Ill. *Mosquitoes and Medical Entomology.*
'16. Gentner, Louis G., 22 Groveland Ave., Medford, Ore. (F. '44). *Halticinae.*
'45. Gerberich, John B., Department of Zoology, University of Minnesota, Duluth Branch, Duluth 5, Minn. *Medical Entomology and Immature Insects.*
Ch. Gerhard, William J., Chicago Museum of Natural History, Chicago 5, Ill. (F. '43). *Hemiptera.*
'44. Gerlach, Charles F., Michigan Chemical Corporation, St. Louis, Mich.
'22. Gerry, Bertram I., Box 28, Wellesley Hills 82, Mass. *Culicidae and Chironomidae.*
'32. Gertsch, Willis J., American Museum of Natural History, 79th Street and Central Park West, New York, N. Y. (F. '40). *Arachnida.*
Ch. Gibson, Arthur, Apt. 6, 30 Cooper St., Ottawa, Ontario, Canada. (F. '17).
'14. Gibson, E. H., Trinity Episcopal Church, Galveston, Tex. *Hemiptera.*
'44. Gibson, W. W., LeMoyne College, Memphis, Tenn.
'21. Gilmer, Paul M., Coastal Plains Experiment Station, Tifton, Ga. *Cotton Insects.*
'11. Glasgow, Hugh, Experiment Station, Geneva, N. Y.
'11. Glasgow, Robert D., State Education Building, Albany, N. Y. *Forest Insects.*
'39. Glick, Perry A., Box 1218, Waco, Texas. *Cotton Insects, Lepidoptera.*

'33. Glover, L. C., Box 486, T. Hall, Durham, N. H. *Carabidae, Cerambycidae.*
'30. Glover, Louise Haas, Shell Agricultural Laboratory, Modesto, Calif. *Carabidae.*
'45. Goelbert, Raymond, 6421 65th Place, Middle Village, N. Y.
'46. Goldberg, Alma Rutledge, 621 St. Johns Road, Baltimore 10, Md.
'30. GOOD, NEWELL E., U. S. Public Health Service, 620 S. 3rd St., Louisville 2, Ky. (F. '43). *Siphonaptera, Culicidae, Stored Grain Beetles.*
'44. Goodwin, M. H., Jr., Assistant Sanitarian, U. S. P. H. S., 605 Volunteer Bldg., Atlanta 3, Ga.
'36. Gouck, Harry K., 1530 Grove Terrace, Winter Park, Fla. *Plecoptera.*
'31. Gould, George E., Purdue University, Lafayette, Ind. *Rhagovelia, Semiaquatic Hemiptera.*
'39. Graham, Lewis T., Southwestern Station, Box 403, Lafayette, La. *Membracidae.*
'17. GRAHAM, SAMUEL A., University of Michigan, Ann Arbor, Mich. (F. '32). *Forest Insects.*
'22. GRANOVSKY, A. A., Division of Entomology, University Farm, St. Paul 1, Minn. (F. '35). *Aphiidae, Phyllophaga.*
'25. Grant, U. S., IV, Natural History Museum, Balboa Park, San Diego, Calif.
'17. Green, J. W., R. D. #2, Easton, Pa. *Cantharidae, Lampyridae.*
'14. GREENE, CHARLES T., 4805 Guilford Road, College Park, Md. (F. '46). *Diptera.*
'43. Gregg, Robert E., Department of Biology, University of Colorado, Boulder, Colo.
'36. *GRESSITT, J. LINSLEY, Natural History Survey & Museum, Lingnam University, Canton, China. (F. '43). *Coleoptera.*
'34. GRIFFITH, MELVIN E., Department of Zoological Sciences, University of Oklahoma, Norman, Okla. (F. '47). *Alconeura, Collembola, Culicidae.*
'42. Griffiths, James T., Jr., Citrus Experiment Station, Lake Alfred, Fla.
'33. *GURNEY, ASHLEY B., Division of Insects, U. S. National Museum, Washington, D. C. (F. '43). *Orthoptera, Zoroptera, Corrodentia.*

H

'23. Hadley, C. H., Bureau of Entomology and Plant Quarantine, Moorestown, N. J. *Japanese Beetle.*
'24. HAEUSSLER, GILBERT J., Bureau of Entomology and Plant Quarantine, Washington 25, D. C. (F. '41). *Ichneumonidae, Braconidae.*
'14. HAGEN, HAROLD R., Department of Biology, College of the City of New York, 139th and Convent Ave., New York 31, N. Y. (F. '38). *Embryology.*
'45. Hagen, Ellsworth, 2647 22nd Ave., Oakland 6, Calif.
'47. Hagen, Kenneth S., Division of Biological Control, University of California, Gill Tract, 1050 San Pablo Ave., Albany 6, Calif. *Notoxus, Amblyderus and Mecynotarsus.*
'25. HALL, DAVID G., 593 Arlington Village, Arlington, Va. (F. '41). *Sarcophagidae, Diptera.*
'41. Hambleton, Edson J., Office of Foreign Agricultural Relations, U. S. Department of Agriculture, Washington 25, D. C. *Tingitidae* (Neotropical).
'47. Hamed Ali, Mir, Division of Entomology, University Farm, St. Paul, Minn.
'22. Hamner, A. L., Box 223, State College, Miss. *Aphididae, Phylloxera.*
'46. *Hanan, Blake B., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio.
'44. Hansens, Elton J., New Jersey Agricultural Experiment Station, New Brunswick, N. J.
'39. Hanson, John F., 47 Mt. Pleasant St., Amherst, Mass. *Plecoptera.*
'39. Harden, Philip H., Department of Zoology, University of Minnesota, Minneapolis, Minn. *Plecoptera.*
'37. Hardy, D. Elmo, Department of Zoology and Entomology, Iowa State College, Ames, Iowa. *Pipunculidae, Bibionidae, Dorilaidae.*
'36. Harmston, Fred Carl, 117 East 27th South, Salt Lake City, Utah. *Dolichopodidae.*
'07. *HARNED, R. W., Bureau of Entomology and Plant Quarantine, Washington 25, D. C. (F. '27).
'33. Harper, Lawrence C., R. R. #1, Lafayette, N. Y. *Diptera.*

'29. HARRIES, F. H., 151 West Eleventh Ave., Columbus, Ohio. *Ecology, Physiology.*
'23. HARRIS, HALBERT M., Department of Zoology, Iowa State College, Ames, Iowa. (F. '37). *Hemiptera.*
'44. Harston, George B., Wyoming State Entomologist, P. O. Box 785, Powell, Wyo.
'47. Harpster, Hilda T., Woman's College of University of North Carolina, Greensboro, N. C.
'42. Hart, Thomas A., 5556 Kimbark Ave., Chicago, Ill.
'39. Hartnack, Hugo, 324 North Fourth St., Tacoma, Wash.
'21. Hartzell, Albert, Boyce Thompson Institute, 1086 North Broadway, Yonkers 3, N. Y. *Cicadellidae.*
'07. Hartzell, F. Z., Agricultural Experiment Station, Geneva, N. Y. *Coleoptera.*
'46. Hasbrouck, Frank, 303 Harker Hall, University of Illinois, Urbana, Ill.
Ch. Haseman, Leonard, Whitten Hall, Department of Entomology, University of Missouri, Columbia, Mo. *Psychodidae.*
'32. HASKINS, CARYL P., Green Acre Lane, Westport, Conn. (F. '44). *Formicidae, Hymenoptera.*
'20. HATCH, MELVILLE H., Department of Zoology, University of Washington, Seattle 5, Wash. (F. '38). *Coleoptera.*
'38. Hathaway, Edward S., Department of Zoology, Tulane University, New Orleans, La. *Ecology of Marsh Insects.*
'32. Haub, James G., Department of Zoology, Ohio State University, Columbus 10, Ohio. *Physiology.*
'39. Haude, William J., c/o John Powell & Company, One Park Ave., New York, N. Y. *Culicidae.*
'30. Haug, Gordon W., Kelowna, British Columbia, Canada. *Formicidae.*
'27. Hawkins, J. H., Agricultural Experiment Station, Orono, Me. *Elaterid and Noctuid Larvae.*
'35. HAYDAK, N. H., Division of Entomology, University Farm, St. Paul 8, Minn. (F. '47). *Honeybee Nutrition.*
'19. HAYES, WILLIAM P., Entomology Building, University of Illinois, Urbana, Ill. (F. '29). *Larvae.*
'31. Heaton, Robert R., 518 Architects & Builders Building, Indianapolis 4, Ind. *Fulgoridae, Homoptera.*
'32. Henderson, Charles, 803 Forty-third Ave., Gulfport, Miss. *Parasites of Scale Insects.*
'31. HENDERSON, LYMAN S., Bureau of Entomology and Plant Quarantine, Beltsville Research Center, Beltsville, Md. (F. '43). *Curculionidae.*
'29. Hering, Paul E., Department of Biology, Carthage College, Carthage, Ill. *Economic Entomology.*
'25. HERMS, WILLIAM B., 112 Agriculture Hall, University of California, Berkeley, Calif. (F. '29). *Medical Entomology.*
Ch. HERRICK, GLENN W., 219 Kelvin Place, Ithaca, N. Y. (F. '14). *Thysanoptera, Coccidae.*
'46. Hershberger, Ruth V., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio.
'43. Hertig, Major Marshall, Sn.C., c/o Headquarters P.C.D., APO 834, c/o Postmaster, New Orleans, La.
'28. Hickman, J. R., Normal College, Ypsilanti, Mich. *Haliplidae.*
'46. Hilchey, John Duncan, Comstock Hall, Cornell University, Ithaca, N. Y.
'08. HILTON, WILLIAM A., 1263 Dartmouth Ave., Claremont, Calif. (F. '39.) *Symphyla, Pauropoda.*
'27. HINMAN, E. HAROLD, Health and Safety Department, Tennessee Valley Authority, Wilson Dam, Ala. (F. '37). *Culicidae.*
'33. HINTON, HOWARD E., Department of Entomology, British Museum (Natural History), Cromwell Road, London S. W. 7, England. (F. '44). *Dryopidae.*
'47. Hobbs, Kenneth Rollin, Department of Entomology, Oregon State College, Corvallis, Ore.
'27. Hockenyos, George L., 213 East Jefferson St., Springfield, Ill. *Economic Entomology.*
'38. Hodge, Charles 4th, Department of Biology, Temple University, Philadelphia, Pa. *Coleoptera.*
Ch. Hodgkiss, H. E., 147 West Park Ave., State College, Pa. *Eriophyiidae.*

'29. HODSON, A. C., Division of Entomology, University Farm, St. Paul, Minn. (F. '43). *Ecology.*
'44. Hoff, C. Clayton, Department of Biology, University of New Mexico, Albuquerque, New Mexico. *Pseudoscorpions.*
'29. Hoffmann, Clarence H., Box 71, Bowie, Md. *Scarabaeidae, Trichiotinax, Osmoderma.*
'20. HOFFMANN, WILLIAM E., Lingnan University, Canton, China. (F. '39). *Hemiptera.*
'35. Holway, Richard T., 9 Crescent St., Shrewsbury, Mass. *Termites.*
'38. Hoogstraal, Harry, Chicago Natural History Museum, Chicago 5, Ill. *Morphology, Culicidae.*
'34. HORSFALL, WILLIAM R., Department of Entomology, University of Illinois, Urbana, Ill. (F. '43). *Bionomics, Culicidae.*
'34. HOSKINS, W. M., 112 Agriculture Hall, University of California, Berkeley, Calif. (F. '47). *Physiology.*
'24. Hough, W. S., Winchester, Va. *Apple Insects.*
'44. Hovanitz, William, University of Michigan, Laboratory of Vertebrate Biology, Ann Arbor, Mich. *Lepidoptera, Genetics, Physiology.*
'39. Hovey, Charles L., Box 728, Eastern States Farmers Exchange, Hedrick Building, West Springfield, Me. *Aphiidae.*
Ch. HOWARD, L. O., Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '07, H. F. '24). *Chalcidoidea.*
'14. HOWARD, NEALE F., 151 West Eleventh Ave., Columbus, Ohio. (F. '44). *Mexican Bean Beetle, Truck Crop Insects.*
'39. Howland, A. F., 1208 East Main St., Alhambra, Calif. *Tomato Insects.*
'23. HUBBELL, THEODORE H., Museum of Zoology, University of Michigan, Ann Arbor, Mich. (F. '39). *Orthoptera.*
'20. HUCKETT, H. C., Long Island Vegetable Research Farm, Riverhead, Long Island, N. Y. (F. '38). *Muscidae.*
'44. Huffaker, Carl B., 1050 San Pablo Ave., Albany 6, Calif. *Mecoptera.*
'39. Hughes, John H., Division of Biological Science, University of Georgia, Athens, Ga. *Chrysomelidae.*
'16. HUNGERFORD, H. B., 323 Snow Hill, University of Kansas, Lawrence, Kans. (F. '27). *Aquatic Hemiptera.*
'43. Hunt, Charles R., Horticulture Branch Experiment Station, Corvallis, Mont. *Collembola.*
'47. Hurd, Paul D., Jr., 112 Agriculture Hall, University of California, Berkeley 4, Calif.
'36. Hurlbut, Herbert S., Naval Medical Research Institute, National Naval Medical Center, Bethesda 14, Md. *Culicidae.*
'38. Hutson, Ray, Department of Entomology, Michigan State College, East Lansing, Mich. *Insecticides.*
'08. HYSLOP, JAMES A., Arsenal, Silver Spring, Md. (F. '35). *Elateridae.*

I

'31. IDE, F. P., Department of Zoology, University of Toronto, Toronto 5, Ontario, Canada. (F. '40). *Ephemeroptera.*
'19. *ILLINGWORTH, J. F., Bishop Museum, Honolulu, Hawaii. (F. '40). *Muscoidea.*
'47. Incho, Harry H., 4512 Mountview Road, Baltimore 29, Md.
'28. Ingram, J. W., Box 387, Houma, La. *Sugarcane Insects.*
'14. ISELY, DWIGHT, Box 3, University Station, Fayetteville, Ark. (F. '34). *Chrysomelidae, Curculionidae.*
'36. ISELY, F. B., 2835 West Gramercy, San Antonio, Tex. (F. '46). *Orthoptera.*
'27. Ives, J. D., Jefferson City, Tenn. *Cave Insects.*
'34. Ivy, Edward E., Box 1218, Waco, Tex.

J

'41. James, Brother Cyprian, Manhattan College, Spuyten Duyvil Parkway, New York 63, N. Y. *Psyllidae.*
'38. James, Freburn L., 1459 East Wilson, Glendale, Calif. *Coleoptera.*
'31. JAMES, MAURICE T., Department of Zoology, State College of Washington, Pullman, Wash. (F. '40). *Stratiomyiidae.*

'30. Janes, Melvin J., 89 Haven Ave., Port Washington, N. Y. *Economic Entomology.*
'35. Jaques, Harry E., 709 North Main, Mount Pleasant, Iowa. *Insect Ecology.*
'30. Jaynes, Harold A., Brooksvale Ave., Mt. Carmel, Conn. *Tiphia of S. A.*
'47. Jenkins, Dale, Army Chemical Center, Edgewood, Maryland.
'41. Jensen, Dilworth D., 112 Agriculture Hall, University of California, Berkeley, Calif. *Psyllidae.*
'15. Jewett, H. H., Agricultural Experiment Station, Lexington, Ky. *Tobacco and Forage Crop Insects.*
Ch. JOHANNSEN, O. A., 203 Parkway, Ithaca, N. Y. (F. '14, H. F. '29). *Diptera.*
'46. Johnson, Donald Ross, Division of Entomology, University Farm, St. Paul 1, Minn.
'25. Johnson, Frank, 420 Lexington Ave., New York 17, N. Y. *Lepidoptera.*
Ch. JONES, FRANK M., 2000 Riverview Ave., Wilmington 47, Del. (F. '46). *Psychidae.*
'47. Jones, Jack Colvard, P. O. Box 803, Auburn, Ala. *Coleoptera.*
'46. Jones, Jack D., Box 92, San Joaquin, Calif. *Cicadidae.*
'39. Jones, J. R. J. Llewellyn, "Arranmore," R. M. D. #1, Cobble Hill, British Columbia, Canada. *Ecology of Lepidoptera Larvae.*
'41. Jones, Joseph W., Department of Zoology, University of Tennessee, Knoxville, Tenn. *Culicidae, Ants (Ponera).*
'45. Jones, Sarah E., Department of Biology, Box 3716, Texas State College for Women, Denton, Tex. *Arachnida.*
'45. Joyce, Charles R., U.S.P.H.S., Quarantine, P. O. Box 1410, Honolulu, T. Hawaii. *Culicidae, Ixodoidea, Siphonaptera.*
'46. Judd, William W., Department of Zoology, McMaster University, Hamilton, Ontario, Canada.
'40. Just, Theodore K., Chief Curator in Botany, Chicago Natural History Museum, Chicago 5, Ill.

K

'42. Kadner, Carl G., Loyola University, Los Angeles, Calif. *Hippoboscidae, Culicidae.*
'34. Kagy, J. Franklin, c/o Dow Chemical Company, P. O. Box 245, Seal Beach, Calif. *Insect Toxicology.*
'26. Kamal, Mohammed, c/o A. Moursi, Minister of Agriculture, Parasite Laboratory, Giza, Egypt. *Cotton Insects.*
'34. KEARNS, CLYDE W., Department of Entomology, University of Illinois, Urbana, Ill. (F. '47). *Insecticides.*
'29. Keck, Chester B., Box 2280, Honolulu, T. Hawaii. *Ecology.*
'14. KENNEDY, C. H., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio. (F. '27). *Odonata, Ants.*
Ch. Kincaid, Trevor, University of Washington, Seattle Wash. *Psychodidae, Dytiscidae.*
'47. King, Edwin W., Box 864, V. P. I., Blacksburg, Va. *Scarabaeidae, Cerambycidae.*
'12. KING, J. L., Box 150, Moorestown, N. J. (F. '32). *Biological Control.*
'28. KING, WILLARD V., Box 3391, Orlando, Fla. (F. '38). *Culicidae.*
'18. KINSEY, ALFRED C., Indiana University, Bloomington, Ind. (F. '28). *Cynipidae.*
'38. KLOTS, ALEXANDER B., Department of Biology, The City College of New York, 17 Lexington Ave., New York, N. Y. (F. '47). *Lepidoptera, Pyralididae, Culicidae.*
'45. Knapp, Virgil R., R. R. #1, Box 100, Zionville, Ind. *Aphididae.*
'11. KNIGHT, H. H., Department of Zoology, Iowa State College, Ames, Iowa. (F. '28). *Hemiptera, Miridae.*
'40. Knight, Kenneth L., Naval Medical Research Institute, Naval Medical Center, Bethesda 14, Md. *Geometrid Larvae, Mosquitoes.*
'24. KNOWLTON, GEORGE F., Utah State Agricultural College, Logan, Utah. (F. '43). *Aphididae.*
'34. KNULL, MRS. DOROTHY, 330 East Dunedin Road, Columbus 2, Ohio. (F. '43). *Cicadellidae, Cercopidae.*

'34. KNULL, JOSEF N., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio. (F. '43). *Cleridae, Elateridae, Buprestidae, Cerambycidae.*
'37. Knutson, Herbert C., R. 1, State College, Kingston, R. I. *Phalaenidae, Culicidae.*
'34. Kottke, Mrs. Esther H., 103 Johnson St., Chapel Hill, N. C. *Isoptera, Hymenoptera.*
'17. Kraatz, Walter C., Department of Biology, University of Akron, Akron, Ohio.
'42. Krafchick, Bernard, 578 Greene Ave., Brooklyn, N. Y.
'41. Kramer, Sol, Department of Entomology, University of Illinois, Urbana, Ill.
'45. Krauss, Noel Louis H., Plant Quarantine Inspector, Territory of Hawaii, 2437 Parker Place, Honolulu 5, Hawaii.
'40. Kretzschmar, Gerhard, Office of the State Entomologist, University Farm, St. Paul 1, Minn. *Soybean Insects.*
'34. KROMBEIN, KARL VON VORSE, Division of Insects, U. S. National Museum, Washington 25, D. C. (F. '44). *Aculeate Hymenoptera.*
'41. Kuitert, Louis C., Entomology Department, Kansas State College, Manhattan, Kans. *Nepidae, Gerridae.*
'36. Kulash, Walter M., Department of Zoology and Entomology, North Carolina State College, Raleigh, N. C. *Collembola.*

L

'45. Laffoon, Jean L., 2704 Lincoln Way, Ames, Iowa. *Diptera.*
'46. La Hue, Delmon W., Georgia Coastal Plain Experiment Station, Tifton, Ga.
'46. Laidlaw, Harry H., University of California, Berkeley, Calif.
'28. Lamiman, J. F., California Polytechnic College, San Dimas, Calif. *Acarina.*
'30. LANDIS, B. J., P. O. Box 218, Union Gap, Wash. (F. '40). *Biological Control.*
'42. Lane, John, Instituto de Higiene de Sao Paulo, Caixa Postal 99 B, Sao Paulo, Brazil.
'40. Lange, W. Harry, Jr., Division of Entomology, University of California, Davis, Calif. *Lepidoptera.*
'25. Langford, George S., Department of Entomology, University of Maryland, College Park, Md. *Economic Entomology.*
'46. Lanham, Urless N., Division of Entomology and Parasitology, University of California, Berkeley, Calif.
'17. Langston, James M., State College, Miss. *Phyllophaga.*
'37. LaRivers, Ira, Division of Entomology, University of California, Berkeley 4, Calif. *Odonata, Psychodidae.*
'14. Larrimer, W. H., U.S.D.A., Forest Service, Washington, D. C. *Cicadellidae.*
'38. Larson, N. P., Box 674, Hulmeville, Pa. *Physiology.*
'37. Lassmann, G. W., Independencia #3, Jalapa, Vera Cruz, Mexico. *Culicidae.*
'13. LATHROP, F. H., Agricultural Experiment Station, Orono, Me. (F. '41). *Cicadellidae.*
'40. Latta, Randall, 11 U. S. Courthouse, El Paso, Texas. *Toxicology.*
'23. Lauderdale, J. L. E., P. O. Box 2006, Phoenix, Ariz.
'47. Lawson, Fred A., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio.
'17. LAWSON, PAUL B., 2215 Vermont St., Lawrence, Kans. (F. '31). *Cicadellidae.*
'39. Leech, H. B., Department of Entomology, California Academy of Science, Golden Gate Park, San Francisco 18, Calif. *Coleoptera.*
'12. LEIBY, R. W., Comstock Hall, Cornell University, Ithaca, N. Y. (F. '40). *Embryology.*
'38. Leonard, Justin W., Institute for Fisheries Research, University Museums Annex, Ann Arbor, Mich. *Aquatic Insects.*
'11. LEONARD, MORTIMER D., 2480 Sixteenth Street N. W., Washington, D. C. (F. '46). *Aphididae.*
'45. Lewis, Sue Sparks (Mrs. W. M.), General Delivery, Sta. A, Ames, Iowa. *Formicidae.*
'47. Lienk, Siegfried E., 303 Harker Hall, Urbana, Ill.
'33. Lilly, John H., King Hall, University of Wisconsin, Madison 6, Wis. *Coleophoridae.*
'34. Lindgren, David L., University of California, Citrus Experiment Station, Riverside, Calif. *Toxicology.*

'39. Lindquist, Arthur W., Box 332, Corvallis, Ore. *Chironomidae.*
'46. Lindsay, Capt. Dale R., 218 W. Kelly, Pharr, Texas. *Diptera.*
'17. LINDSEY, A. W., Denison University, Granville, Ohio. (F. '40). *Hesperioidea.*
'33. *LINSLEY, E. GORTON, 112 Agricultural Hall, University of California, Berkeley, Calif. (F. '41). *Cerambycidae, Coleoptera.*
'47. Lipovsky, Louis J., Department of Entomology, University of Kansas, Lawrence, Kans.
'25. LIST, GEORGE M., Agricultural College, Fort Collins, Colo. (F. '32). *Cimicidae.*
'30. Livingstone, E. M., 4425 Bienville Ave., New Orleans, La.
'31. Lloyd, Llewellyn, University of Leeds, London, England.
'19. Lobdell, Mrs. Gladys H., Route 2, Brevard, N. C. *Coccidae.*
'46. Ludwig, Carl E., 33 Lebanon St., Winchester, Mass.
'38. Ludwig, Daniel, Department of Biology, New York University, 181st Street and University Avenue, New York 53, N. Y. *Physiology.*
'13. LUGINBILL, PHILIP, Box 495, Lafayette, Ind. (F. '41). *Phyllophaga.*
'34. Lund, Horace O., Division of Biological Science, University of Georgia, Athens, Ga. *Culicidae.*
'31. Lyle, Clay, Box 1538, State College, Miss. *Crustacea.*
'40. Lyman, F. Earle, U.S.P.H.S., P.H.S. 3472, 412 Hilldale Ave., Decatur, Ga. *Aquatic Insects, Ephemeroptera.*

M

'43. Mackenzie, George P., 1284 Sherwood Road, San Marino 9, Calif. *Coleoptera.*
'40. MacSwain, J. W., 112 Agricultural Hall, Department of Entomology, University of California, Berkeley 4, Calif.
'20. McBride, O. C., Research Center, Beltsville, Md. *Insecticides.*
'43. McCall, George L., 905 Bertrand Ave., Manhattan, Kans. *Chemical Control of Insects.*
'29. McClure, H. Elliott, Box 292, Station A, Bakersfield, Calif. *Ecology.*
'10. McDaniel, Eugenia, Agricultural College, East Lansing, Mich. *Coccidae, Orthoptera.*
'30. McGovran, E. R., Office of Experiment Station, U.S.D.A., Washington, D. C. *Insecticides.*
'11. McINDOO, N. E., 7225 Blair Road, Takoma Park, Washington 12, D. C. (F. '34). *Insect Physiology.*
'32. Madden, A. H., Bureau of Entomology and Plant Quarantine, Box 3391, Orlando, Fla. *Economic Entomology.*
'47. Magner, Marshall, 1700 S. 2nd, St. Louis, Mo.
'43. Maina, Bartholomew A., 10623 Church St., Chicago, Ill. *Bombidae.*
'46. Malkin, Borys, University of Oregon, Department of Anthropology, Eugene, Ore. *Coccinellidae.*
'40. Mangrum, James F., Box 203 F. E., Biology Department, A. & M. College, College Station, Texas. *Acarina.*
'13. *MANN, WILLIAM M., Natural Zoological Park, Washington, D. C. (F.'37). *Formicidae.*
'23. Manter, Jerauld A., Agricultural College, Storrs, Conn. *Economic Entomology.*
'37. Markos, Basil G., 2180 Milvia St., Berkeley, Calif. *Toxicology.*
Ch. MARLATT, C. L., 1521 Sixteenth Street N. W., Washington, D. C. (F. '07, H. F. '41). *Coccidae.*
'25. Martin, Charles H., Department of Entomology, Oregon State College, Corvallis, Ore. *Ecology, Asilidae.*
'43. Martin, Esmond B., 465 East 57th St., New York 22, N. Y.
'34. MARTORELL, LUIS F., Agricultural Experiment Station, P. O. Box 614, Rio Piedras, Puerto Rico. (F. '44). *Sugar Cane, Forest Insects.*
'38. Marvin, Philip H., Hartford Road, Moorestown, N. J. *Biology of Melittobia.*
'30. Mason, Horatio C., 151 West Eleventh Ave., Columbus 11, Ohio. *Tomato Fruitworm.*
'46. Mason, William R. M., Comstock Hall, Cornell University, Ithaca, N. Y. *Ichneumonoidea.*
'47. Massey, Calvin L., Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, Fort Collins, Colo.

Ch. MATHESON, ROBERT, Cornell University, Ithaca, N. Y. (F. '28). *Ixodoidea, Culicidae.*
'36. Mead, Albert R., Department of Zoology, University of Arizona, Tucson, Ariz. *Chrysomelidae.*
'37. MEDLER, JOHN T., Department of Entomology, University of Wisconsin, Madison, Wis. (F. '47). *Cicadellidae.*
'25. Meiners, Edwin, Room 238, 6651 Enright, St. Louis 5, Mo. *Lepidoptera.*
Ch. MELANDER, A. L., 4670 Rubidoux Drive, Riverside, Calif. (F. '14). *Diptera.*
'27. Melvin, Roy, c/o Boyce Thompson Institute, 1086 N. Broadway, Yonkers 3, N. Y. *Physiology.*
'46. Mender, Manuel Barro, Calle 12, Nr. 220, Altos, Apart. 3, Vedado, Habana, Cuba.
'33. Menusan, Henry, Jr., 204 Agriculture Education Building, Pennsylvania State College, State College, Pa. *Physiology, Ecology.*
'23. Merrill, G. B., Plant Board, Seagle Building, Gainesville, Fla. *Coccidae, Aleyrodidae.*
'12. METCALF, C. L., Department of Entomology, University of Illinois, Urbana, Ill. (F. '20). *Syrphidae.*
'39. Metcalf, Robert L., Citrus Experiment Station, University of California, Riverside, calif. *Insect Physiology.*
'09. METCALF, Z. P., State College Station, Box 5215, Raleigh, N. C. (F. '34). *Homoptera.*
'35. MICHELBACHER, A. E., 112 Agricultural Hall, University of California, Berkeley 4, Calif. (F. '41). *Symphyla, Apoidea.*
'37. MICHENER, CHARLES D., American Museum of Natural History, 70th St. and Central Park West, New York, N. Y. (F. '44). *Apoidea.*
'17. MICKEL, CLARENCE E., Division of Entomology, University Farm, St. Paul 1, Minn. (F. '35). *Mutillidae.*
'36. Miller, Albert, Tulane Medical School, 1430 Tulane Ave., New Orleans, La. *Culicidae.*
'31. Miller, Albert C., P. O. Drawer 2038, Pittsburgh, 30, Pa. *Membracidae.*
'42. Miller, E. Morton, Department of Zoology, Box 452, University of Miami, Coral Gables, Fla. *Termites.*
'46. Miller, Ralph H., Chaffey College, Euclid at 5th, Ontario, Calif.
'37. Milliron, Herbert E., Division of Entomology and Economic Zoology, University of Minnesota, St. Paul, Minn. *Chalcidoidea, Bombidae.*
'29. MILLS, HARLOW B., Illinois Natural History Survey, Urbana, Ill. (F. '37). *Aptera.*
'37. MILNE, LORUS J., Department of Zoology, University of Vermont, Burlington, Vt. (F. 47). *Trichoptera.*
'25. Milum, Vern G., 104 Vivarium Building, University of Illinois, Champaign, Ill. *Apiculture.*
'43. el Minchaoui, Ibrahim, c/o Societe Generale des Sucreries et de la Raffinerie d'Egypte, P. O. B. 763, Cairo, Egypt. *Sugarcane pests.*
'26. MINNICH, D. E., Department of Zoology, University of Minnesota, Minneapolis 14, Minn. (F. '39). *Behavior.*
'38. Miroyiannis, Stanley D., Department of Biology, Northeastern University, Boston, Mass. *Histology.*
'39. Mitchell, Robert T., Patuxent Research Refuge, Bowie, Md. *Ichneumonidae and Braconidae.*
'21. MITCHELL, T. B., State College, Raleigh, N. C. (F. '37). *Apoidea, Megachile.*
'22. MONTGOMERY, B. ELWOOD, Department of Entomology, Purdue University, Lafayette, Ind. (F. '31). *Odonata, Coleoptera.*
'39. Moore, George A., 359 Querbes, Ave., Outremont, Quebec, Canada. *Hemiptera.*
'39. Moore, Warren, Bon Air, Va. *Dermestidae.*
'47. Morgan, Cecil V. G., Dominion Entomological Laboratory, Box 30, Summerland, British Columbia, Canada. *Mites.*
Ch. Morgan, H. A., 2424 Kingston Pike, Knoxville, Tenn.
Ch. MORRILL, A. W., 460 W. Longden Ave., Arcadia, Calif. (F. '39).
'12. MORRISON, HAROLD, Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '28). *Coccidae.*

'08. MOSHER, EDNA, R. R. #1, Newport, Nova Scotia, Canada. (F. '20). *Lepidoptera.*
'20. Mote, Don C., State Agricultural College, Corvallis, Ore. *Economic Entomology.*
'29. MOULTON, DUDLEY, 35 Elwood St., Redwood City, Calif. (F. '31). *Thysanoptera.*
'15. MUESEBECK, C. F. W., Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '34). *Braconidae, Bethylidae.*
'36. Mulrennan, J. A., State Board of Health, Box 201, Jacksonville, Fla. *Culicidae.*
'43. Muma, Martin H., Department of Entomology, University of Nebraska, Lincoln, Nebr.
'27. *Munro, J. A., State College Station, Fargo, N. D. *Orthoptera, Diptera.*
'37. Munson, Sam C., Department of Biology, George Washington University, Washington 6, D. C.
'35. *MURRAY, WILLIAM D., 4460 Rosemary Parkway, Columbus 2, Ohio. (F. '46). *Sphecidae.*
'28. MUSGRAVE, ANTHONY, Australian Museum, College Street, Sydney, New South Wales, Australia. (F. '41). *Nycteribiidae.*
'27. Musgrave, Paul N., 1956 Underwood Ave., Huntington, W. Va. *Dryopidae.*
'47. Myers, Theodore B., 1786 Gerrard Ave., Columbus 12, Ohio.

N

'46. Nakajima, Toshio, Entomological Institute, Fac. of Agr. Hokkaido, Sapporo, Imperial University, Japan. *Scarabaeidae.*
Ch. NEEDHAM, J. G., 6 Needham Place, Ithaca, N. Y. (F. '07, H. F. '35). *Odonata, Ephemerida.*
'21. Neiswander, C. R., Ohio Agricultural Experiment Station, Wooster, Ohio. *Insects of Ornamentals.*
'28. Neiswander, R. B., Ohio Agricultural Experiment Station, Wooster, Ohio. *Fruit Insects.*
'39. Nesbitt, Herbert H. J., 34 Lakeside Ave., Ottawa, Ontario, Canada. *Acarina.*
Ch. Ness, Henry, 821 Kellogg Ave., Ames, Iowa. *Economic Entomology.*
'34. Nevin, F. Reese, Plattsburg State Teachers College, Plattsburg, N. Y. *Morphology of Acarina.*
Ch. Newcomer, E. J., Box 1291, Yakima, Wash. *Fruit Insects.*
'15. Newman, George B., 246 East Hamilton Ave., State College, Pa. *Insect Histology.*
'28. Newton, Richard C., Bureau of Entomology and Plant Quarantine, Bozeman, Mont. *Alfalfa Weevil.*
'47. Nicolaides, George, U. S. Quarantine Station, Rosebank, Staten Island, N. Y.
'38. Nicholson, H. Page, U.S.P.H.S., C. D. C., Technical Development Division, Box 769, Savannah, Ga. *Simuliidae.*
'31. Nickels, C. B., Box 209, Bureau of Entomology, Brownwood, Tex. *Pecan Insects.*
'47. Nishida, Toshiyuki, 628 Marmion St., Honolulu 13, Hawaii.
'22. Noble, W. B., Bureau of Entomology and Plant Quarantine, Box 1857, Sacramento 9, Calif. *Cereal and Forage Insects.*
'38. Noland, Lowell E., Biology Bldg., University of Wisconsin, Madison, Wis.
'17. *Notman, Howard, Circle Road, Dougan Hills, Staten Island, N. Y. *Carabidae, Staphylinidae.*
'37. Nye, William P., Department of Entomology, Room 225, Utah State Agricultural College, Logan, Utah. *Forest Insects.*

O

'31. O'Byrne, Harold I., R. F. D. #1, Box 792, Glencoe, Mo. *Ecology, Lepidoptera.*
'44. Ogloblin, Alexander, 3120 Sanabria, Buenos Aires, Argentina.
'08. O'KANE, WALTER C., Durham, N. H. (F. '24).
'29. OMAN, PAUL W., Bureau of Entomology and Plant Quarantine, Washington 25, D. C. (F. '40). *Homoptera.*
'46. O'Neill, Kellie, U. S. D. A., Box 896, Macon, Ga. *Culicidae, Rhynchophora.*

'37. O'Neill, William J., Tree Fruit Branch Experiment Station, Box 596, Wenatchee, Wash. *Fruit Insects.*
'34. Oosthuizen, M. J., School of Agriculture, Potchefstroom, South Africa. *Stored Grain Insects.*
Ch. OSBORN, HERBERT, Ohio State University, Columbus, Ohio. (F. '07, H. F. '28). *Homoptera, Cicadellidae.*
'08. Osborn, H. T., 75 Highland Ave., Los Gatos, Calif. *Cicadellidae.*
Ch. OSBURN, R. C., Hancock Foundation, University of Southern California, Los Angeles 7, Calif. *Syrphidae.*
'43. Osmun, John V., Mountain Ave., Murray Hill, N. J.
'46. Owen, Robert P., 401 Washington Ave., Brooklyn, N. Y.
'36. Owen, William Bert, Department of Zoology, University of Wyoming, Laramie, Wyo. *Culicidae.*
'45. Owsley, William B., Kentucky Wesleyan College, Winchester, Ky. *Cerambycidae.*
'25. OZBURN, REG. H., Ontario Agricultural College, Guelph, Ontario, Canada. (F. '43). *Insect Histology.*

P

'15. Packard, Clyde M., Bureau of Entomology and Plant Quarantine, Washington, D. C. *Cereal and Forage Insects.*
'18. Painter, H. R., 705 Bexley Road, West Lafayette, Ind. *Phyllophaga.*
'19. PAINTER, R. H., Department of Entomology, Kansas State College, Manhattan, Kans. (F. '35). *Diptera, Bombyliidae.*
'39. Palm, Charles E., Department of Entomology, Cornell University, Ithaca, N. Y. *Forage Crop Insects.*
'37. Palmer, Boyd B., Polytechnic Institute, San German, Puerto Rico. *Trichoptera.*
'27. PALMER, MIRIAM A., 621 South Howes St., Fort Collins, Colo. (F. '37). *Aphidae.*
'47. Parfinowich, Sophy I., U. S. National Museum, Washington 25, D. C.
'27. PARK, ORLANDO, Department of Zoology, Northwestern University, Evanston, Ill. (F. '40). *Pselaphidae.*
'39. Parker, Barbara M., 635 Hinman Ave., Evanston, Ill.
'25. PARKER, H. L., European Parasite Laboratory, 58 Rue Jules Parent, Reuil-Malmaison, Seine et Oise, France. (F. '40). *Parasitic Hymenoptera.*
'24. Parker, R. L., Department of Entomology, Kansas State College, Manhattan, Kans. *Apiculture.*
'18. Parks, T. H., Department of Entomology, Ohio State University, Columbus, 10, Ohio.
'24. Parman, D. C., Box 509, Uvalde, Tex. *Diptera.*
'43. Parr, Thaddeus, Whitemarsh Research Laboratory, Box 4388, Chestnut Hill P. O., Philadelphia 18, Pa.
Ch. PARROTT, P. J., Agricultural Experiment Station, Geneva, N. Y. (F. '14).
'12. PARSHLEY, H. M., Department of Zoology, Smith College, Northampton, Mass. (F. '43). *Heteroptera.*
'32. PARSONS, CARL T., 238 East 62nd St., New York, N. Y. (F. '46). *Coleoptera.*
'34. Parten, Herbert H., Division of Entomology, University Farm, St. Paul 8, Minn. *Greenhouse Insects.*
'32. Passos, Cyril F. dos, Washington Corners, Mendham, N. J. *Lepidoptera.*
Ch. *PATCH, EDITH M., P. O. Box 150, Orono, Me. (F. '14). *Aphididae.*
'47. Patton, Robert L., Department of Entomology, Cornell University, Ithaca, N. Y.
'35. Paullus, Harold J., Midwest Division, California Packing Corporation, Rochelle, Ill.
'23. *PAYNE, NELLIE M., c/o American Cyanamid Company, Boston Post Road, Stamford, Conn. (F '40). *Physiology.*
'20. PEAIRS, L. M., Morgantown, W. Va. (F. '40).
'34. Pechuman, La Verne L., 7 Davison Road, Lockport, N. Y. *Tabanidae.*
'46. Peck, Oswald, Division of Entomology, Department of Agriculture, Confederation Building, Ottawa, Ontario, Canada. *Hymenoptera.*
'40. Pederson, Calvin E., Department of Entomology, Michigan State College, East Lansing, Mich. *Cicadellidae.*
'47. Pelot, Betty Lou, 1128 Connecticut St., Lawrence, Kans.

'37. Pelton, John Z., 205 First Ave., Waverly, Ohio. *Aquatic Insects.*
'47. Penn, George H., III, Department of Zoology, Tulane University, New Orleans 15, La. *Diptera, Culicidae.*
'35. Penner, Lawrence R., Department of Zoology and Entomology, University of Connecticut, Storrs, Conn. *Delphacidae, Muscoidea.*
'30. Pepper, Bailey B., Department of Entomology, Agricultural Experiment Station, New Brunswick, N. J. *Biological Control.*
'29. Peters, Harold T., State Teachers College, Bemidji, Minn. *Siphonaptera.*
'39. Peterson, Allan G., Division of Entomology, University Farm, St. Paul 1, Minn. *Potato Insects, Aphiidae, Miridae, Culicidae.*
'11. PETERSON, ALVAH, Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio. (F. '28). *Biological Control.*
'37. Peterson, Lloyd O. T., Indian Head, Saskatchewan, Canada. *Forest Entomology.*
'07. PETRUNKEVITCH, ALEXANDER, Yale University, New Haven, Conn. (F. '37). *Arachnida.*
'43. Pfadt, Robert E., Department of Entomology, University of Wyoming, Laramie, Wyo. *Orthoptera.*
'21. PHILLIPS, E. F., Cornell University, Ithaca, N. Y. (F. '29). *Apiculture.*
'47. Phillips, Grace R., 373 William St., East Orange, N. J.
'12. Phillips, W. J., 718 Cargill Lane, Charlottesville, Va. *Harmolita.*
'37. Phillips, W. Levi, 985 South Third East, Salt Lake City 4, Utah. *Lepidoptera.*
Ch. PIERCE, W. DWIGHT, 1074 Browning Blvd., Los Angeles 37, Calif. (F. '30). *Rhynchophora.*
'41. Platt, Fred R., Deputy Agricultural Commissioner, Court House, Riverside, Calif. *Coccidae, Coleoptera.*
'41. Pletsch, Donald J., Economic and Scientific Section, GHQ, SCAP, APO 500, c/o P. M., San Francisco, Calif. *Psyllidae, Myrmeleonidae.*
'28. PLUMMER, C. C., Apartado Number 3, Colonia Anahuac, Mexico, D. F., Mexico. (F. 44). *Membracidae.*
'18. POOS, FRED W., Beltsville Research Center, Beltsville, Md. (F. '43).
'23. Porter, B. A., Bureau of Entomology and Plant Quarantine, Washington, D. C. *Fruit Insects.*
'43. Porter, John E., 512 W. Nevada St., Urbana, Ill.
'35. Post, Richard L., Department of Entomology, University of North Dakota, Fargo, N. D. *Thysanoptera.*
'44. Potts, Robert W. L., Room 6, Agricultural Building, Embarcadero at Mission, San Francisco 5, Calif. *Scarabaeidae, Acaraeinae.*
'26. Potts, Samuel F., 56 Hillhouse Ave., New Haven, Conn. *Toxicology, Physiology.*
'36. *PRATT, HARRY D., U. S. Public Health Service, District No. 6, San Juan, Puerto Rico. (F. '46). *Ichneumonidae.*
'47. Pratt, John Jacob, Jr., Comstock Hall, Cornell University, Ithaca, N. Y.
'16. Price, W. A., University of Kentucky, Lexington, Ky. *Economic Entomology.*
'32. *PRITCHARD, A. EARL, Division of Entomology, University of California Berkeley, Calif. (F. '43). *Asilidae, Itonididae.*
'28. PROCTER, WILLIAM, Bar Harbor, Mr. (F. '40). *Insects of Mt. Desert Region.*
'33. Putnam, W. L., Dominion Entomological Laboratory, Vineland Station, Ontario, Canada. *Chrysopidae.*

Q

'36. Quarterman, Kenneth D., 7 Bright St., Savannah, Ga. *Cimicidae.*
'46. Quraishi, M. Sayeed, Fernald Hall, University of Massachusetts, Amherst, Mass.

R

'44. Ramos, J. A., Department of Biology, University of Puerto Rico, Mayaquez, Puerto Rico.
'42. Ramsay, Maynard J., 37 John St., Staten Island 2, N. Y. *Coleoptera, Larvae.*
'43. Rapp, William F., Jr., Gaylord Hall, Doane College, Crete, Nebr. *Diptera, Psychodidae.*
'14. RAU, PHIL, 549 East Argonne Drive 22, Kirkwood, Mo. (F. 27). *Hymenoptera, Behavior.*
'44. Redd, Jabus Constantine, Box 1538, State College, Miss.

'46. Redlinger, Leonard M., Entomology Department, Kansas State College, Manhattan, Kans. *Diptera—Empididae.*
'23. Reed, W. D., 3609 Military Road, N. W., Washington 15, D. C. *Tobacco Insects.*
'30. Rees, Don M., University of Utah, Salt Lake City, Utah. *Culicidae.*
'23. Reeves, Joseph A., 530 Federal Building, Buffalo 3, N. Y. *Chrysomelidae, Fulgoridae.*
'44. Reeves, William C., Hooper Foundation for Medical Research, San Francisco 22, Calif.
Ch. REHN, J. A. G., Academy of Natural Sciences of Philadelphia, 19th-The Parkway, Philadelphia 3, Pa. (F. '14). *Dermaptera, Orthoptera.*
'45. Reichart, Charles V., Department of Biology, Providence College, Providence 8, Rhode Island. *Hemiptera.*
'43. Remington, Charles L., Department of Zoology, Harvard University, Cambridge 38, Mass. *Thysanura, Entotrophi, Lepidoptera.*
'34. Rice, Paul L., Department of Entomology, Agricultural Experiment Station, Newark, Del. *Chalcidoidea.*
'30. RICHARDS, A. GLENN, JR., Entomology Department, University Farm, St. Paul 1, Minn. (F. '38). *Noctuidae.*
'14. RICHARDSON, CHARLES H., Department of Entomology, Iowa State College, Ames, Iowa. (F. '31). *Physiology.*
'29. RICHARDSON, MAJ. H. H., U.S.D.A. Quarantine Inspection Station, 209 River St., Hoboken, N. J. (F. '41). *Physiology.*
'28. Richmond, Edward A., 31 Rosemont Ave., Frederick, Md. *Hydrophilidae.*
'46. Ricker, William E., Department of Zoology, Indiana University, Bloomington, Ind. *Plecoptera.*
'39. Riedel, F. A., 2894 Dexter St., Denver 7, Colo.
'43. Rieder, Robert E., Shell Oil Co., Terminal Sales Building, Portland 5, Ore.
'39. Riegel, Garland T., Department of Entomology, University of Illinois, Urbana, Ill. *Braconidae.*
'22. Ries, Donald T., Department of Biology, Illinois State Normal University, Normal, Ill. *Cephidae, Siricidae.*
'40. Riherd, Paul T., Box 42, Stafford, Tex. *Truck Crop Insects.*
Ch. RILEY, WILLIAM A., Department of Zoology, University of Minnesota, Minneapolis, Minn. (F. '14). *Parasitology.*
'39. Rings, Roy W., 1158 Oakland Ave., Columbus, Ohio. *Cerambycidae.*
'33. RITCHER, PAUL O., Agricultural Experiment Station, Lexington, Ky. (F. '44). *Phyllophaga.*
'36. Ritchie, C. L., Box 340, Honolulu 9, Hawaii. *Coccidae, Lepidopterous Larvae.*
'47. Rivero, Juan A., Biology Department, College of Agriculture, Mayaquez, Puerto Rico.
'39. Roark, R. C., Bureau of Entomology and Plant Quarantine, Beltsville, Md. Insecticides.
'47. Roback, Selwyn S., 3 Grove Place, Ithaca, N. Y. *Diptera.*
'40. Roberts, H. Radclyffe, Box 490, Bryn Mawr, Pa. *Acrididae.*
'31. Roberts, J. Harvey, Box 8729, University, La. *Trichoptera.*
'43. Roberts, Reed S., 346 West First North, Logan, Utah.
'45. Robinson, John H., P. O. Box 63, Barksdale Field, La.
'15. Robinson, J. M., Box 671, Auburn, Ala. *Dermestidae.*
'45. Robinson, Paul Francis, 21 Fenwood Road, Boston 15, Mass.
'26. ROBINSON, WILLIAM, Burnt Mills Hills, Silver Spring, Md. (F. '39). *Physiology.*
'41. Rockstein, Morris, Division of Entomology, University of Minnesota, University Farm, St. Paul, Minn.
'13. Rockwood, L. P., 130 Third Ave. S. E., Forest Grove, Ore. *Noctuidae, Orthoptera.*
'31. Rodeck, Hugo G., University of Colorado Museum, Boulder, Colo. *Nomada.*
'44. Rodock, Roy Edgar, Lewiston State Normal School, Lewiston, Idaho.
'47. Rodriguez, Juan G., Department of Entomology, Ohio Agricultural Experiment Station, Wooster, Ohio.
'15. ROGERS, J. SPEED, Museum of Zoology, University of Michigan, Ann Arbor, Mich. (F. '43). *Tipulidae.*
'41. *Rogoff, William M., University of California, Citrus Experiment Station, Riverside, Calif.

'27. ROHWER, S. A., Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '29). *Hymenoptera.*
'25. Rosewall, O. W., Box 8729, Department of Entomology, Louisiana State University, Baton Rouge 3, La. *Coleoptera, Pentatomidae.*
'39. Ross, EDWARD S., Department of Entomology, California Academy of Sciences, Golden Gate Park, San Francisco 18, Calif. *Histeridae, Embioptera.*
'31. Ross, HERBERT H., Illinois Natural History Survey, Urbana, Ill. *Sawflies, Caddisflies.*
'12. Ross, William A., Vineland Station, Ontario, Canada. *Aphidae.*
'40. Roth, Louis M., Quartermaster Research and Development Laboratories, Biological Laboratories, Philadelphia Quartermaster Depot, 2800 South 20th St., Philadelphia 45, Pa. *Diptera, Culicidae.*
'36. ROZEBOOM, LLOYD EUGENE, School of Hygiene and Public Health, 615 North Wolf St., Baltimore 5, Md. (F. '46). *Culicidae.*
'14. RUCKES, HERBERT, 167-11 33rd Ave., Flushing, New York, N. Y. (F. '47). *Pentatomidae.*
'39. Rude, Clifford S., Abasolo 518 Ote, Torreon, Coah., Mexico. *Ixodidae.*
'46. Russell, Louise M., Bureau of Entomology and Plant Quarantine, Washington 25, D. C.
'42. Ryan, George S., R. R. #4, Angola, Ind. *Noctuiidae.*

S

'33. *SABROSKY, CURTIS W., Division of Insects, U. S. National Museum, Washington, D. C. (F. '41). *Chloropidae.*
'41. Sailer, Reece I., Division of Insects, U. S. National Museum, Washington 25, D. C. *Hemiptera.*
'38. Sailsbury, Murl B., 824 Gaffield Place, Evanston, Ill. *Chrysomelid Larvae.*
'46. Sakagami, Shoichi, Entomological Institute, Hokkaido, Imperial University, Sapporo, Hokkaido, Japan.
'29. Sakimura, K., Pineapple Research Institute, Box 3166, Honolulu 2, Hawaii. *Thysanoptera.*
'46. Sallee, Roy M., 131 North Normal Street, Macomb, Ill. *Formicidae.*
'37. Sampson, William W., 156 South Fourteenth St., Richmond, Calif. *Aphididae, Aleurodidae.*
'31. SANDERSON, MILTON W., Illinois Natural History Survey, Urbana, Ill. (F. '43). *Coleoptera.*
'07. SATTERTHWAIT, A. F., 806 Ohio St., Urbana, Ill. (F. '30). *Calendra.*
'46. Sawamoto, Takahisa, Hokkaido Forest Experiment Station, Toyohira 5 jo 13 chome, Sapporo, Japan. *Scolytidae, Scolydoplatopidae, Platypodidae.*
'29. Scaramuzza, L. C., Central Mercedes, Prov. of Matanzas, Cuba. *Sugar Cane Insects.*
'30. Schlosberg, Morris, P. O. Box 606, West Lafayette, Ind. *Lepidoptera.*
'29. Schmidt, Carl T., Box 3166, Honolulu, Hawaii. *Ecology.*
'33. Schmidt, Helen D. O'Neil, Box 3166, Honolulu, Hawaii. *Trichoptera.*
'20. SCHMIEDER, RUDOLF G., Zoology Laboratory, University of Pennsylvania, Philadelphia, Pa. (F. '47). *Hymenoptera.*
'32. SCHMITT, JOHN B., Department of Entomology, New Jersey Agricultural Experiment Station, New Brunwsick, N. J. (F. '43). *Morphology.*
'34. Schmitt, T. J., Jr., Apt. 16, 1086 Corona St., Denver 3, Colo. *Scolytidae.*
'44. Schnitzer, Robert C.
Ch. SCHOENE, W. J., Agricultural Experiment Station, Blacksburg, Va. (F. '44).
'47. Schoenherr, William H., P. O. Box 673, Danville, Ill.
'36. Schoof, Herbert F., 302 Horne St., Raleigh, N. C. *Chrysomelidae.*
'29. Schroeder, H. O., 5601 Patrick Henry Drive, Baltimore, Md. *Ixodoidea, Argasidae.*
'40. Schuh, Joe, 705 NE 97th St., Portland 16, Ore. *Odonata.*
'26. SCHWARDT, H. H., Department of Entomology, Cornell University, Ithaca, N. Y. (F. '35). *Tabanidae.*
'26. SCHWARZ, HERBERT F., American Museum of Natural History, 70th St. and Central Park West, New York, N. Y. (F. '37). *Meliponidae.*
'28. Scotland, Minnie B., 42 Continental Ave., Cohoes, N. Y. *Lemna Insects.*
'46. Scudder, Harvey I., Department of Entomology, Cornell University, Ithaca, N. Y. *Culicidae, Coleoptera, Lampyroidea.*

'25. SCULLEN, H. A., Department of Entomology, Oregon State College, Corvallis, Ore. (F. '40). *Cerceridae.*
'46. Seabrook, Edwin L., County Courthouse Annex, West Palm Beach, Fla.
'23. Seamans, H. L., 616 Confederation Building, Ottawa, Ontario, Canada. *Muscoidea.*
'41. Sears, Jack W., B. L. 319, University of Texas, Austin 21, Tex.
'36. SEEVERS, CHARLES H., Roosevelt College, 420 South Michigan, Chicago 5, Ill. (F. '46). *Termitophiles, Staphylinidae (Aleocharinae).*
'08. SEVERIN, H. C., South Dakota State College, Brookings, S. D. (F. '39). *Orthoptera, Homoptera, Heteroptera.*
'07. SHAFER, GEORGE D., 321 Melville Ave., Palo Alto, Calif. (F. '41). *Physiology.*
'46. Sharp, S. S., Department of Zoology and Entomology, Iowa State College, Ames, Iowa. *Toxicology.*
'35. SHAW, FRANK R., Fernald Hall, Massachusetts State College, Amherst, Mass. (F. '46). *Mycetophilidae.*
'29. Shaw, John G., Laboratorio Entomologico, Apt. Number 3, Colonia Anhuac, D. F., Mexico.
Ch. SHELFORD, V. E., Vivarium Building, Wright and Healy Sts., Champaign, Ill. (F. '20). *Ecology.*
'43. Shenefelt, Roy D., Department of Entomology, University of Wisconsin, Madison 6, Wis.
'22. SHEPARD, HAROLD H., Insecticide Testing Laboratory, U.S.D.A., Beltsville, Md. (F. '39). *Hesperiidae.*
'11. SHERMAN, JOHN D., JR., 132 Primrose Ave., Mt. Vernon, N. Y. (F. '39). *Dytiscidae.*
'34. Shields, S. E., 346 Berry Field, Nashville, Tenn. *Culicidae.*
'35. *Shockley, Wilfred, 1180 Sherman St., Denver 3, Colo. *Cerambycidae, Decticinae.*
'28. Shropshire, Leslie H., c/o Fairmont Packing Company, Fairmont, Minn. *Economic Entomology.*
Ch. SHULL, A. FRANKLIN, 431 Highland Road, Ann Arbor, Mich. (F. '39). *Aphididae.*
'15. SILVESTRI, FILIPPO, Scuola Superiore d'Agricoltura, Portici, Italy. (F. '20). *Thysanura, Protura, Termites, Myriopoda.*
'42. Simmonds, Frederick J., Imperial Parasite Service, Belleville, Ontario, Canada.
'29. Simmons, Perez, 712 Elizabeth St., Fresno 3, Calif. *Dried Fruit Insects.*
'39. Simonds, William E., R. F. D. #1, Box 26, Ojai, Calif. *Elateridae.*
'30. *Simpson, Geddes W., Holmes Hall, Orono, Me. *Insects and Plant Diseases.*
'38. Singleton, J. M., 209 River St., Hoboken, N. J. *Quarentines.*
'46. Slater, James A., Department of Zoology and Entomology, Iowa State College, Ames, Iowa.
'43. Slifer, Eleanor H., Department of Zoology, State University of Iowa, Iowa City, Iowa.
'32. Smith, Carroll N., 710 East Concord Ave., Orlando, Fla. *Ixodidae.*
'32. Smith, Charles E., Agricultural Experiment Station, University Branch, Baton Rouge, La. *Truck Crop Insects.*
'35. SMITH, CLYDE F., Department of Entomology, University of North Carolina, Raleigh, N. C. (F. '46). *Aphididae.*
'27. SMITH, FLOYD F., Agricultural Research Center, Beltsville, Md. (F. '43). *Aphididae, Taisonemidae.*
'41. Smith, Gordon F., P. O. Box 907, Bakersfield, Calif. *Diptera.*
'35. Smith, Howard W., 919 N. Fourth St., Manhattan, Kansas.
'37. Smith, Marion E., Fernald Hall, Massachusetts State College, Amherst, Mass. *Arctiidae.*
'19. SMITH, MARION R., Room 377, U. S. National Museum, Washington 25, D. C. (F. '38). *Formicidae.*
'42. Smith, Ray F., 112 Agriculture Hall, University of California, Berkeley 4, Calif. *Diabrotica, Colias.*
'14. SMITH, ROGER C., Department of Entomology, Kansas State College, Manhattan, Kans. (F. '31). *Neuroptera.*
'44. Smith, William Ward, U.S.P.H.S., Jackson 113, Miss.
'18. Snapp, Oliver I., Box 527, Fort Valley, Ga. *Rhynchophora.*

'39. Snipes, B. Thomas, Dodge & Olcott, Inc., P. O. Box 550, Powell, Wyo. *Siphonaptera.*
'24. SNODGRASS, R. E., 3706 Thirteenth St. N. W., Washington 10, D. C. (F. '27). *Morphology.*
'45. Snow, Willis E., Department of Entomology, University of Illinois, Urbana, Ill.
'44. Snyder, Everett G., Department of Biological Science, Michigan State College, East Lansing, Mich. *Diptera, Morphology and Economic Entomology.*
'36. Snyder, Fred M., 721 Oak Ave., Orlando, Fla. *Muscoidea.*
'38. Sommerman, Kathryn M., Division of Parasitology, Army Medical School, A.M.C., Washington 12, D. C. *Carrodentia.*
'26. Sorenson, Charles J., Agricultural Experiment Station, Logan, Utah. *Miridae.*
'14. *Spencer, G. J., University of British Columbia, Vancouver, British Columbia, Canada. *Trypetidae.*
'19. SPENCER, HERBERT, Box 112, Fort Pierce, Fla. (F. '37). *Hymenoptera, Citrus Insects.*
Ch. SPOONER, CHARLES S., 1436 Seventh St., Charleston, Ill. (F. '43). *Fulgoridae.*
'30. Stanley, W. W., Agricultural Experiment Station, Knoxville, Tenn. *Phalaenidae.*
'46. *Stannard, Lewis J., Jr., Illinois Natural History Survey, Urbana, Ill. *Thysanoptera.*
'35. Stehr, William C., Department of Zoology, Ohio University, Athens, Ohio. *Coccinellidae, Carabidae.*
'27. Steiner, L. F., 1237 Washington Ave., Vincennes, Ind. *Fruit Insects.*
'46. Steinhaus, Edward A., Insect Pathology Laboratory, University of California, Berkeley 8, Calif.
'29. Steinweden, John B., Bureau of Nursery Service, State Department of Agriculture, Sacramento, Calif. *Coccidae, Thysanoptera.*
'31. STEWART, M. A., Division of Entomology, 112 Agriculture Hall, University of California, Berkeley, Calif. (F. '41). *Siphonaptera.*
'15. Stiles, Charles F., Box 29, Stillwater, Okla.
'23. Stirrett, George M., Dominion Entomological Laboratory, Chatham, Ontario.
'38. Stitt, Loyd L., Western Washington Experiment Station, Puyallup, Wash. *Miridae.*
'27. STONE, ALAN, Bureau of Entomology and Plant Quarantine, Washington 25, D. C. (F. '40). *Simuliidae, Tabanidae, Culicidae.*
'36. Stone, Philip C., 105 Whitten Hall, University of Missouri, Columbia, Mo. *Ixodidae.*
'28. Stone, William E., Laboratorio Entomologica, Apartado Number 3, Colonia Anahuac, D. F., Mexico.
'42. Strandtmann, R. W., Department of Preventive Medicine, Medical Branch, University of Texas, Galveston, Texas. *Specidae, Acarina: Laelaptidae.*
'12. Strickland, E. H., Main Library, University of Alberta, Edmonton, Alberta, Canada. *Elateridae.*
'25. Strohecker, H. F., Department of Zoology, University of Miami, Coral Gables 34, Fla. *Orthoptera.*
'34. Strom, L. G., Box 992, U.S.P.H.S., Brownsville, Texas. *Aphiidae.*
'46. Strong, Rudolph G., P. O. Box 1538, State College, Miss.
'31. Summerour, A. R., Box 173, Lucedale, Miss.
'23. SWEETMAN, HARVEY L., State College, Amherst, Mass. (F. '43). *Ecology.*
'20. SWEZEY, OTTO H., 2044 Lanihuli Drive, Honolulu 5, Hawaii. (F. '30). *Delphacidae, Lepidoptera.*
'44. Swift, Hewson H., 535 W. 113th St., New York 25, N. Y. *Araneida, Ichneumonidae.*

T

'46. Takahsi, Hirosi, Entomological Institute, Hokkaido Imperial University, Sapporo, Japan. *Simuliidae and Tabanidae.*
'37. Talbot, Mary, Lindenwood College, St. Charles, Mo. *Formicidae.*
'47. Tanada, Yoshinori, 511 Hiram Lane, Honolulu 22, T. Hawaii.
'36. Tanner, M. C., 2902 Jackson Ave., Ogden, Utah. *Plecoptera.*

'27. TANNER, VASCO M., Brigham Young University, Provo, Utah. (F. '46). *Tenebrionidae, Carabidae.*
'31. Tate, H. Douglas, U. S. Rubber Co., Naugatuck Div., Bethany 15, Conn.
'36. *TAUBER, OSCAR E., Department of Zoology, Iowa State College, Ames, Iowa. (F. '47). *Physiology.*
'47. Taylor, Earl J., 174 North 1 West, Logan, Utah.
'22. Taylor, Leland H., Department of Botany, West Virginia University, Morgantown, W. Va. *Aculeate Hymenoptera.*
'34. *Telford, Horace S., Washington State College, Department of Zoology, Pullman, Wash. *Syrphidae.*
'47. Telford, Paul E., Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio.
'40. Thatcher, T. O., 700 S. 31st St., Apt. 2C, Richmond, Calif. *Scolytidae, Buprestidae, Cerambycidae.*
'21. Thomas, Charles A., State College Laboratory, Kenneth Square, Chester County, Pa. *Elateridae, Scarabaeidae.*
'32. THOMAS, EDWARD S., Ohio State Museum, Ohio State University, Columbus 10, Ohio. (F. '46). *Orthoptera.*
'38. Thomas, Henry D., North Park College, Foster and Kedzie, Chicago 25, Ill.
'15. Thomas, F. L., Agricultural Experiment Station, College Station, Texas. *Cotton Insects.*
'39. Thompson, W. L., Box 1074, Lake Alfred, Fla. *Citrus Insects.*
'10. THOMPSON, W. R., 228 Dundas St., Belleville, Ontario, Canada. (F. '27). *Tachinidae.*
'47. Thornton, Dorothy Golden, 7407 Dickinson Ave., College Park, Md.
'46. Thurman, Deed C., Jr., CDC Activities, U.S.P.H.S., P. O. Box 210, Jacksonville, Fla. *Culicidae.*
'22. TIETZ, HARRISON M., Department of Zoology, Pennsylvania State College, State College, Pa. (F. '46). *Noctuidae.*
'11. TIMBERLAKE, P. H., Citrus Experiment Station, Riverside, Calif. (F. '38). *Encyrtidae.*
'23. Tissot, A. N., Agricultural Experiment Station, Gainesville, Fla. *Aphididae.*
'26. Todd, F. E., c/o Bee Culture, Beltsville, Mad. *Apiculture.*
'33. *TOWNES, HENRY K., JR., 17 Elm St., McLean, Va. (F. '43). *Ichneomonidae, Chironomus.*
'28. Towsend, Lee H., Department of Entomology, University of Kentucky, Lexington, Ky. *Neuroptera.*
'36. TRAGER, WILLIAM, Rockefeller Institute, Princeton, N. J. (F. '47). *Insect Nutrition.*
'39. Traub, Major Robert, Department of Parasitology, A.M.D.R.G.S., Army Medical Center, Washington 12, D. C.
'46. Travassos, Lauro P., Department of Zoologia, Sec. da Agricultura, C. postal 172-A, Sao Paulo, S. P., Brazil.
'30. TRAVER (MISS) JAY R., Fernald Hall, Massachusetts State College, Amherst, Mass. (F. '35). *Ephemeridae.*
'30. Travis, Bernard V., Box 3391, Orlando, Fla. *Culicidae.*
'39. Trembley, Helen L., National Institute of Health, Bethesda 14, Md.
'47. Truman, Lee C., 2701 Winthrop Ave., Indianapolis 5, Ind.
'47. Truxal, Frederick A., 505 Lane 11, Sunflower Village, Lawrence, Kans.
'34. Trippel, A. W., Indiana Department of Conservation, Box 408, Auburn, Ind. *Chrysomelidae.*
'38. Tuck, Joseph B., Morrisville, Mo. *Orthoptera.*
'28. Tulloch, George S., Department of Biology, Brooklyn College, Bedford Avenue and Avenue H., Brooklyn 10, N. Y. *Morphology.*
'08. Turner, William F., P. O. Box 162, Fort Valley, Ga.
'29. *TUTHILL, L. D., University of Hawaii, Honolulu, Hawaii. (F. '43). *Psyllidae, Fulgoridae.*

U

'47. Ullyett, Gerald Cumming, 228 Dundas St., Belleville, Ontario, Canada.
'32. USINGER, ROBERT L., Division of Entomology, University of California, Berkeley, Calif. (F. '41). *Heteroptera, except Corixidae.*

V

'22. Vance, Arlo M., Box 606, West Lafayette, Ind. *Ecology.*
Ch. Van Dine, D. L., 805 Crescent Drive, Alexandria, Va. *Fruit Insects.*
Ch. VAN DYKE, E. C., Department of Entomology, California Academy of Science, Golden Gate Park, San Francisco, Calif. (F. '17). *Coleoptera.*
'39. Vazquey, Leonila (Miss), Instituto de Biologia, Casa del Lago, Chapultepec, D. F., Mexico. *Psychidae.*
'43. Vernard, Carl E., Department of Zoology, Ohio State University, Columbus 10, Ohio.
'48. Vincent, Lloyd E., Division of Entomology, Citrus Experiment Station, Riverside, Calif.
'40. Vogt, George B., University of Maryland, College Park, Md. *Coleoptera, Hemiptera.*

W

'15. WADE, J. S., Bureau of Entomology and Plant Quarantine, Washington, D. C. (F. '37). *Coleoptera.*
'21. WADLEY, F. M., 3215 N. Albemarle, Arlington, Va. (F. '39). *Aphididae.*
'18. Wainwright, C. J., 50 Christchurch Road, Bournemouth, England. *Tachinidae.*
'22. Walkden, Herbert H., Bureau of Entomology and Plant Quarantine, 201 Post Office Building, Hutchinson, Kans. *Noctuidae.*
'10. WALKER, E. M., Department of Biology, University of Toronto, Toronto 5, Ontario, Canada. (F. '14). *Odonata, Orthoptera.*
'30. Walker, Harry G., R. F. D. #1, Langhorne, Pa. *Economic Entomology.*
'38. Wallace, George E., Department of Entomology, Carnegie Museum, Pittsburgh, Pa. *Chalcididae.*
'46. Wallace, Herbert S., Department of Entomology, University of Kansas, Lawrence, Kans. *Acrididae.*
'23. Wallace, Hugh E., 210 Santa Rita, Modesto, Calif.
'32. WALLEY, G. STUART, Entomological Branch, Ottawa, Ontario, Canada. (F. '41). *Hymenoptera, Hemiptera.*
'37. Walter, E. V., Box 495, Lafayette, Ind. *Economic Entomology.*
'47. Walters, Hubert J., 203 Harker Hall,
'17. WALTON, WILLIAM R., 4323 Madison St., Hyattsville, Md. (F. '37).
'46. Watanabe, Chihisa, Entomological Institute, Hokkaido Imperial University, Sapporo, Hokkaido, Japan. *Parasitic Hymenoptera.*
'25. Watson, S. A., Friends University, Wichita 12, Kans. *Miridae, Hemiptera.*
'46. Watson, Wynnfield Y., 1c Benlamond Avenue, Toronto 13, Canada. *Coleoptera.*
'34. WEBER, NEAL A., Department of Zoology, Swarthmore College, Swarthmore, Pa. (F. '44). *Formicidae.*
Ch. WEBSTER, R. L., Agricultural Experiment Station, Pullman, Wash. (F. '32).
'45. Wechsler, Harry I., 2125 Holland Ave., Bronx, New York, N. Y.
Ch. WEED, CLARENCE M., 854 Andover St., Lowell, Mass. (F. '24).
'18. Wehrle, L. P., 1130 East Helen St., Tucson, Ariz. *Coccidae, Aphididae.*
'17. Weigel, C. A., Bureau of Entomology and Plant Quarantine, Beltsville, Md. *Greenhouse Insects.*
'39. Weiman, Carl J., 725 South Foley St., Champaign, Ill. *Insecticides.*
'45. Weisgerber, A. F., 340 North Seventh St., Newark 7, N. J.
'13. WEISS, HARRY B., 19 North Seventh Ave., New Brunswick, N. J. (F. '37). *Ecology.*
'12. WELCH, P. S., Department of Zoology, University of Michigan, Ann Arbor, Mich. (F. '20). *Aquatic Insects.*
'07. WELD, LEWIS H., 6613 North Washington Blvd., East Falls Church, Va. (F. '41). *Cynipidae.*
'21. Wellhouse, Walter H., Department of Entomology, Iowa State College, Ames, Iowa.
'46. Wellhouse, William T., 1113 W. Tenth St., Lawrence, Kans.
'44. Wene, George, Texas Agricultural Experiment Station, Substation #15, Welaco, Tex.
'39. Wenzel, Rupert L., Chicago Natural History Museum, Roosevelt Road and Field Drive, Chicago, Ill. *Histeridae.*
'46. Werner, Floyd G., 702 Pearl St., Ottawa, Ill.

'36. West, A. S., Jr., Department of Biology, Queen's University, Kingston, Ontario, Canada. *Buprestidae.*
'45. West, Fenton T., Moorehead State Teachers College, Morehead, Ky.
'43. West, Luther S., Northern Michigan College of Education, Marquette, Mich. *Diptera.*
'42. Westfall, Minter J., Jr., Department of Biology, University of Florida, Gainesville, Fla.
'41. Weymarn, Michael A., 1349 South Ave., Stratford, Conn.
'18. Whedon, A. D., North Dakota State College, Fargo, N. D. *Odonata.*
'22. WHEELER, GEORGE C., University Station, Grand Forks, N. D. (F. '40). *Formicidae, Eucharidae.*
'32. Whitcomb, W. D., 240 Beaver St., Massachusetts State College Experiment Station, Waltham, Mass.
'29. Wilbur, D. A., Kansas State College, Manhattan, Kans. *Homoptera, Cicadellidae.*
'24. WILCOX, JOSEPH, 1208 East Main, Alhambra, Calif. (F. '41). *Asilidae.*
'35. Wild, William, 249 Walnut St., East Aurora, N. Y. *Microlepidoptera.*
'36. Wilkes, A., Dominion Parasite Laboratory, 228 Dundas St. E., Belleville, Ontario, Canada.
'47. Wilkins, Orin Perry, 301 W. 35th St., Austin, Texas.
'29. Will, Homer C., Juniata College, Huntington, Pa. *Tenthredinoidea.*
'38. WILLEMSE, C., Eygelshovan, Z. L., Holland. (F. '46). *Orthoptera.*
'14. WILLIAMS, C. B., Rothansted Experiment Station, Harpenden, Herts, England. (F. '30). *Migrations of Insects.*
'44. Williams, Genevieve, 2955 Blaine, Apt. 408, Detroit 6, Mich.
'38. Williams, J. L., Box 72, Lincoln University, Pa. *Lepidoptera.*
'40. Williams, Lt. Roger W., DeLamar Institute of Public Health, 600 West 168th St., New York 32, N. Y. *Disease Transmission.*
'44. Wilson, Clifton A., Department of Zoology and Entomology, Mississippi State College, State College, Miss.
'23. Wilson, C. C., P. O. Box 1857, Sacramento, Calif. *Orthoptera.*
'33. Wilson, Edward H., Star Route, Gray, Me.
'25. Wilson, F. H., Department of Biology, Champlain College, Plattsburg, N. Y. *Mallophaga.*
'30. Wilson, John W., 5 West Washington St., Bath, N. Y. *Economic Entomology.*
'45. Wilson, Kent Hale, 430 Ridgewood Road, Fort Worth 7, Tex.
'28. Windsor, Margaret, 220 Santa Rita, Palo Alto, Calif. *Stratiomyiidae.*
'37. Wing, Merle W., Department of Zoology and Entomology, North Carolina State College, Raleigh, N. C. *Formicidae.*
'41. *Wirth, Willis W., Mosquito Control Section, 15 Shattrick Square, Berkeley, Calif. *Culicidae, Reduviidae.*
Ch. *Wirtner, M., St. Vincent Archabbey, Latrobe, Pa. *Hemiptera.*
'27. Wisecup, C. B., 515 Humboldt, Manhattan, Kansas. *Insecticides.*
Ch. WOGLUM, R. S., Box 2706, Terminal Annex, Los Angeles 54, Calif. (F. '39).
'31. Woke, P. A., Division of Tropical Diseases, National Institute of Health, Bethesda 14, Md. *Culicidae.*
'34. Wolfenbarger, D. Otis, Route 2, Box 508, Florida Sub-Tropical Experiment Station, Homestead, Fla. *Economic Entomology.*
'47. Wood, Gilbert C., 73-12 35th Ave., Jackson Heights, N. Y.
'42. Wood, Stephan L., River Heights, Logan, Utah. *North American Scolytidae.*
'14. Wood, W. B., 4620 Butterworth Place, N. W., Washington, D. C.
'37. Woodbury, Elton N., Naval Stores Department, Hercules Powder Company, Wilmington, Del. *Insecticides.*
'25. WOODRUFF, L. C., Department of Entomology, University of Kansas, Lawrence, Kans. (F. '35). *Insect Physiology.*
'45. Worcester, Douglas John, P. O. Box 805, Puunene, Maui, Hawaiian Islands.
'22. Worthley, H. N., 683 Shadowlawn Drive, Westfield, N. Y. *Insecticides.*
'28. WRAY, DAVID L., JR., Department of Agriculture, Raleigh, N. C. (F. '43). *Collembola.*
'41. Wright, Gilbert, Illinois State Museum, Springfield, Ill.
'39. Wright, Mike, Department of Biology, Tusculum College, Greenville, Tenn. *Odonata.*

Y

'46. Yancey, Robert M., Department of Entomology, Oregon State College, Corvallis, Ore.
'43. Yergason, Robert M., 50 Farmington Ave., Hartford, Conn. *M.D.*
'31. YEAGER, J. F., Beltsville Center, Beltsville, Md. (F. '37). *Physiology.*
'40. Yolles, Mrs. T. Knigin, 189 East 18th St., Brooklyn, N. Y.
'28. Young, Hiram C., Box 132, Florala, Ala. *Cotton Insects.*

Z

'07. ZETEK, JAMES, Drawer C, Balboa, Canal Zone. (F. '39). *Trypetidae.*
'41. *ZIMMERMAN, ELWOOD C., Bishop Museum, Honolulu 35, T. Hawaii. (F. '46).

Total membership, 985; Fellows, 281; Honorary Fellows, 11.